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SOIL CONSERVATION

Index

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UNITED STATES DEPARTMENT OF AGRICULTURE
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SOIL CONSERVATION—INDEX TO VOLUME XXIX

AUGUST 1963 TO JULY 1964

	Page
ABBOTT, F., DE WITT: Native Pecans Paying Crop for Kansas Conservation Farmers. With Luther J. Gaskell	34–35
ACHTERMANN, ADRIAN—	
Seepy-Pastures, Springs Pay Off for Ohio Farmers	68–69
Vacation Farms for City People. With Larry R. Decker	221–222
Adams, Mrs. Ploma, had first conservation farm plan in U.S. (S.C.)	135
Agricultural Marketing Service, conducts supporting scientific research for RAD	133
Agricultural Research Service—	
conducts scientific research for RAD	133
conducts wind erosion studies (Kans.)	152–154
cooperates in salt accumulation study (Calif.)	81
kept cost records of parallel terraces	249
research workers effective in windbreaks in the Great Plains	162
specialists continue to devise and try out new techniques	267
stabilization of streambanks	199–201
states 3 percent reduction in sediment discharge Buffalo Creek project (N.Y.)	197
studies show sometimes only 25 to 50 percent of water withdrawn	53
universal wind erosion equation	154
watershed research on farmlands rests with	281
Agricultural Stabilization and Conservation Service—	
administers commodity price support and related programs for RAD	133
administers Cropland Conversion Program (Wash.)	185
applied for assistance under Cropland Conversion Program	87
cost-share funds, clearing juniper (Oreg.)	19
cost-shared funds to level farm (Ariz.)	258
cost-shared two dams (Minn.)	65
cost-share agreement, grazing assoc. (Colo.)	12
cost-sharing for wildlife and recreation	173
cost-sharing on rangeland (Utah)	5
helped develop wind erosion prog. (Mass.)	150
helped financed irrigation system (Ark.)	276
helped in Yazoo-Little Tallahatchie watershed development (Miss.)	204
helped land operators in Great Plains	223
helped with Flat Creek watershed (Ark.)	207
Agricultural Stabilization and Conservation Service—Continued	Page
helps in effective windbreaks in the Great Plains	162
proved wind erosion measures	154
provided cost-sharing reforestation (Ohio)	82
provides cost-sharing for water leveling riceland (La.)	258
referred CCP application to SCS (La.)	136
shared cost of concrete ditch lining (Wyo.)	23
shoulders half of pipe and riser system	68
structure and pipeline with risers cost-shared by (Oreg.)	47
Alabama—	
applies bahiagrass	8
Brothers Switch Farm From Row Crops to Recreation. Jimmy Holland and Walter S. Allen	173-174
Hine Pine Creek watershed saved $28,000 in bridges and roads	254
SCS introduced fescue into	14
water policy study recommended	64
Alaska, snow survey made in	213
ALCORN, FRED B.: Conservation Berry Farming	39–40
ALLEN, WALTER S.—	
Alabama Brothers Switch Farm From Row Crops to Recreation. With Jimmy Holland	173–175
District Profile, Rev. Tillman (Ga.)	237
Flood Prevention Story Gets Headlines	254
Georgia Conservation Farm Lake Serves People of Four Counties	178–179
Southeast Borrows From West to Fight Own Wind Erosion	158–160
ALLRED, B. W.: Review of Report on the Lands of the Arid Region of the U.S	72
ALLRED, WILLIAM M.: In Western Michigan— It's an Ill Wind That Blows No Good	157–158
ALVERSON, KENT: Flood-Proofing Pays Off for Indiana Farmers and Their Towns	201–203
AMUNDSON, ARTHUR J., Jr.: Kickapoo Conservation Orchards Bring People and Money to Valley. With Robert E. Lee	56–57
ANDERSON, DONALD J.: Watershed Project Protects Montana City Against Floods	251
ANDERSON, ED: California Farmer Finds Grass Crops Beat Wheat	21–22
ANDERSON, ROY C.: Golf course—Homesite Developer Revamped Plan to Fit Land	107–110

194074

Page

Anderson, W. D., credits sound conservation treatment of his land (Colo.) 126
Annual Report, SCS 1963 227–234
Apmann, Robert P.: Research Seeks Best Techniques for Stabilizing Stream Channels 199–201
Archer, Sellers G.—
Earthmoving Is Big Part of Soil and Water Conservation. With C. J. Francis 243–245
Farm Ponds in Smokies' Shadow Yield Trout for Fun and Profit 187–188
Fertilizer and Rest Bring Fescue Back 14–15
Area Redevelopment Administration—
aid for Hardeman County (Tenn.) 236
RAD program involves industrial loans through 85
Arizona—
Farmer installed basin irrig. system 248
farmers restore alkali contaminated lands to irrigated fields 142
snow surveys made in 213
Arkansas—
Caney Creek watershed saves farmers $150,000 a year 254
declaration applied only to surface waters 64
Jackson Co. SCD program 274
minnow farming increasing in 284
record rains spilled floodwaters, to 255
reservoirs to hold water, rice-farming area 276
Watershed Team Speeds Flood Prevention and Recreation. Hollis R. Williams 206–208

Baker, John A.: Excerpts from "A Place to Live," *The Yearbook of Agriculture* 133
Bannister, Stanley: Palouse Farmer's Alfalfa-and-grass Saves Moisture 53–54
Barnard, John W.: Revised Programs Show Expanding Districts Role 274–75, 78
Basal Plantings Healing Road Cuts Nature's Way. Paul Tabor 10–11
Beach, Dearl B.: Colorado Small-Watershed Dams Stop Floods—Bring Recreation 215–216
beach erosion stilled by grass (Del.) 238–239
Bechtel, R. C., leveled salty fields 142
"Bedded" Lands Solve New Yorker's Hay Problem. Charles B. Woodruff, Jr 58–59
Bell, Elbert L.: Kansas Watershed Gives Up Record Bass 189–190
Bellard, Chester: "Hi Neighbor!" Company's Key to Conservation Recreation 131
Bender, William H.: Ela Township Involves 119 Soils. With Raymond L. Newbury 103–104
Bierwagen, Gilbert G.: Conservation Showplace Farm Not Bothered by Drought Now 166–167
Bird Feeding Leads Virginia into Hunting Lodge Business. N. L. Ramsey 183–184
Boddy, Herb: Washington Farmers Solving Problem of Too Much Water. With Everett Loreen 211–212

Page

Boy Scouts developing lake in Scout Ranch Twin Caney (Kans.) 206
Britt, C. S.: Timing Peach Orchard Cover Crops to Cut Down Moisture Competition. With R. R. Robinson 41–42
Brown, Warren J.: Water—The "Stuff That Keeps Them Going" 55–56
Brush control with spraying program (Utah) 6
Buchmeier, Roy H.: Conservation Increases Feed for Hungry Teton Elk Herd. With Arthur F. Halloran 180–181
Buffalo Creek First of 11 Early Flood Prevention Projects Done: Irving B. Stafford and Adelbert D. Ward 197–199
Burch, Dr. R. F., and father, have quail-hunting paying business (Ga.) 93
Bureau, Marvin F.: It's Maple Syrup Time Again! With Donald D. Kline 175–177

California—
Farmer Finds Grass Crops Beat Wheat. Ed Anderson 21–22
farming practices are taming wind erosion in vineyards 28
has 300 or more snow courses 213
Ladino clover cover crop for orchard. Cover picture [26]
Los Angeles and Santa Ynez watersheds 196
principal market for Daley's apples 38
rancher helps conceive step dam 286
soil-cement lining. Cover picture [242]
Urbanization Spurs Citrus Land Shifts—Conservation. Alex Franklin and Bob Richardson 80–81
Cappleman, H. L.: Is Your Dam a Bargain? 279–280
Carlton, Earl P.: Terraces Stop "Wet Feet" in Ohioan's Peach Orchard 46
Carpenter, John, got better use of water by pipeline (Nev.) 67
Carrying Capacity for Recreation Applies Basic Ideas in New Setting. Frank C. Edminster 271–272
Cattle—
Better, Not More Cattle Is Ranchers' Goal. Hal L. Rogers 16–17
carried on Coastal bermuda (La.) 9
get forage from seepy springs (Ohio) 68
grazing controlled (Colo.) 12–14
grazing on established pastures (Ala.) 15
on converted wheat ranch (Calif.) 21–22
channel improvement exceeds 160 million cubic yards 244
Civilian Conservation Corps camp assisted in soil and water conservation practice (Ill.) 40
Clark, Warren and Robert, converted part of farm to golf course (Iowa) 86–87
Coffee Production, Conservation Helps Bring Back Puerto Rico's. J. F. Marrero 42–43
Cole, Sam: "Moisture Accounting" Method for Irrigation Tobacco Growers 69–70

Colorado— Page
conserving water from melting mountain snow important in Pine River Valley 55
farmer gets good return for every dollar spent on soil conservation 126
Farmers—Ranchers Take Wind Out of Drought. Mott R. Duncan 167–168
Grazing Association Has Profitable Land-Use Aim. T. K. Eaman 12–14
Klubert Warembourg, District Profile 137
orchard better from cover cropping floor 45
recreation. Cover picture [170]
Small-Watershed Dams Stop Floods—Bring Recreation. Dearl B. Beach 215–216
snow surveys made in 213
Colvin, John, Jr.: Basin Irrigation System Stops High Pumping Costs 258–259
Conklyn, James H.: Good Soil Management Helps West Virginia Apple Grower 44–45
Connecticut townships obtained soil maps of community land from SCS 224
Conservation—
at home project (Pa.) 245
Berry Farming. Fred B. Alcorn 39–40
contractors important 256
Fruits of. Clyde T. Lowe 38–39
Increases Feed for Hungry Teton Elk Herd. Arthur F. Halloran and Roy H. Buchmeier 180–181
New Horizons in, Excerpts from 1963 Annual Report, Soil Conservation Service 227–234
Not More Land—Fills Coloradan's Income Needs. Lynn R. Healey 126
planning and application, fiscal 1963 231
Planning Brings Com. Cash—Better Living. Gordon Gibson and C. R. Patton 127–128
Reserve Program Land diverted from wheat to cattle (Calif.) 22
Saves Farmers' Water in Utah Drought Counties. Clyde W. Larsen 283–284
Showplace Farm Not Bothered by Drought Now. Gilbert G. Bierwagen 166–167
Technology. Donald A. Williams 267
Today's, Planning Is Shaped to Broadened Needs. Val W. Silkett 123–125
Conservation Needs Inventory—
published 229
showed 40 percent of springs developed for livestock water (Ohio) 69
showed 28.6 million acres of rangeland brush in Texas and Oklahoma 17
shows earthmoving not finished in 1964 243
shows 8,000 small watersheds to be of size and needing project action 53
Contour Planting—Water Use Serve Citrus Growers. Howard E. Van Arsdall 32–34
Cooperative Federal-State Extension Services provide assistance in RAD committees 133
Cover Crop(s)—
control wind (Mass.) 151
considered a must in orchards (Wash.) 48
effective on peach orchards (Va.) 41
Cover Crop(s)—Continued Page
Lick Wind Erosion for Red River Valley. Nels Snustad and H. A. Tvedten 163–164
makes money in orchard (Oreg.) 47
Prevent Erosion. John Dixon 45
reduce drought and wind damage (Colo.) 167–168
Seeding From the Air. Robert H. Mills 24
to break the wind (S.C.) 160
to offset fall plowing (Ill.) 165
Cropland—
Conversion—
Is Boon to These Hunters and Fishermen. Hugh Tidwell 136
Program cost-sharing wildlife and recreation (Wash.) 185–186
Cross, John M.—
Elementary Teaching Students Tie Conservation to Subjects 262–263
Watershed Dam to Provide Recreation Area 285
Crownveth Rewards Skill, Care in District Seed Plot. George P. Thorburn and Virgil B. Hawk 268

Dailey, R. M.: Community Watershed Dam Helps Cut Fire Insurance 134–135
Daley, Donald, proper use of irrigation water 38
Dam(s)—
Building a Floodwater Retarding. (Picture story.) William T. McClure, Jr 252–253
earth sites and foundation studied 248
Is Your, a Bargain? H. L. Cappleman 279–280
Step, Builds Self and Stops Gully With Sediment. Bill Phillips 286–287
3,003 floodwater-retarding 244
will provide fresh water fishing (La.) 285
Davey William B.: Rice Irrigation Reservoirs Help Water Needs and Economy 276–277
Davis, Leonard J., prefers single-row pattern-type windbreaks (N. Dak.) 61
Dean, John O.: Wind Erosion Control in Vineyards Helps California's Cucamonga Area 28–30
Decker, Larry R.: Vacation Farms for City People. With Adrian Achtermann 221–222
Decker, Rey S.: Soil Mechanics Tests Guide Design of Earth Structures 247–248
Delaware Beach Owner Stops Waves' Damages. Gordon S. Smith 238–239
Despain David W.: Trees Against the Wind 287–288
Devin, J. Acree, hunting business 183–184
Ditch lining, concrete answers irrigation water ter control problem (Utah) 283
Dixon, John: Cover Crops Prevent Erosion—Produce Tastier Fruit 45
Dove, Walter H.: Ohio Farmland Is Converted to City People's Playground 82–83
Drainage—
more effective in Marshland and French Creek areas (Wash.) 212
of orchards on wetlands (Fla.) 33

Drainage—Continued Page
open more effective than tile drains in heavy soil (Utah) 62
Porters Creek District project (Tenn.) 236
Drought—
and wind damage reduced (Colo.) 167
defeated by soil conservation (S. Dak.) 166–167
DUNCAN, MOTT R.: Colorado Farmers-Ranchers Take Wind Out of Drought 167–168
DWYER, CARROLL: Review of Soil Conservation in South Africa 240
DYKES, J. C.: Review of Land and Water Use 143–144

EAMAN, T. K.: Colorado Grazing Association Has Profitable Land-Use Aim 12–14
Earthmoving—
parallel terrace cost depends on amount of 249–250
Part of Soil and Water Conservation. C. J. Francis and Sellers G. Archer 243
EBERHART, PERRY: Passion Play Director Also Good Soil Steward 225–226
Economic(s)—
of reservoirs in rice area (Ark.) 277
wind erosion control program helps Cucamonga area (Calif.) 28
Economic Research Service—
conducts supporting research for RAD 133
cooperates on flood control 196
provides basic economic data on watershed research 281
EDMINSTER, FRANK C.: Carrying Capacity for Recreation 271–272
Education—
conservation at Camp Elbanobscott (Mass.) 177–178
elementary class tied soil conservation to subjects in elementary education (La.) 262
Electronic(s)—
Computers Join SCS Team in Planning for Watershed Protection. H. O. Ogrosky 272–273
surveying 263
Elementary Teaching Students Tie Conservation to Subjects. John M. Cross 262–263
ELLSBURY, LYMAN E.: Ponies—Grass Seed—and Conservation 22–23
Enfinger, James and Eulon, converted cropland to recreation (Ala.) 173
Engineers, U.S. Corps—
cooperated in soil survey plant (S.C.) 78
established big dams, Yazoo-Little Tallahatchie watershed (Miss.) 204
has mainstem flood control 195
sediment damage Buffalo Creek based on figures furnished by (N.Y.) 198
snow surveys coordinated by SCS 213
Equipment Helps District Do Efficient Conservation Job. Ben Mace 141
Etheridge, Paul, grows Shetland ponies and grass seed (Wyo.) 22

Excerpts from "A Place to Live," *The Yearbook of Agriculture*. Orville L. Freeman 132–133

farm-city interests 75–96
Farmer Cooperative Service—
conducts supporting research for RAD 133
dedicated to building rural resources 86
Farmers and Conservationists Apply Research Findings. Edward R. Weimer 154–155
Farmers Home Administration—
helped in Yazoo-Little Tallahatchie watershed development (Miss.) 204
helped land operators in Great Plains 223
helps in windbreaks in the Great Plains 162
made a loan Flat Creek watershed (Ark.) 207
made loan for rural home building (Va.) 89
makes loans for recreation (Wash.) 185
offers loans for developing income-producing recreation enterprises 173
permits loans to nonprofit association (Colo.) 12
plays production emergency loan role for RAD 133
Federal Crop Insurance Corp. has a leading role in RAD program 133
Federal Extension Service—
dedicated to building rural resources 86
helped develop wind erosion program (Mass.) 150
helped in Carroll County's rural development plan (Va.) 188
helped land operators in Great Plains 223
helped with Flat Creek watershed (Ark.) 208
helps in windbreaks in the Great Plains 162
FERBER, A. E.: "What Happened to the Shelterbelt?" 160–162
Fertilizer and Rest Bring Fescue Back. Sellers G. Archer 14–15
fescue management formula in Alabama 14–15
fire department and watershed project grew up together (N.C.) 134
Fish and Wildlife Service, U.S.—
administers Jackson Hole Elk Refuge (Wyo.) 180
cooperates on flood control 196
helped with Flat Creek watershed (Ark.) 208
Fish(es)—
harvest growing into a business (N.C.) 187
minnow farming (Ark.) 284–285
Flood(s)—
Are Being Prevented Watershed by Watershed. Gladwin Young 195–197
Big Sandy watershed dams saved (Colo.) 215
Box Elder Creek watershed against (Mont.) 251
Buffalo Creek water, first completed (N.Y.) 197
control by Bee Creek; Grant-Shanghai, Twin Big, Middle Caney (Kans.) 205–206
damage mitigated by snow surveys 213
flow estimates on watersheds complicated 281
Marshland, French Creek watersheds (Wash.) 211
Ohio. H. O. Ogrosky 255–256

Flood(s)—Continued Page
on Red River of the North (N. Dak.). Cover picture [194]
prevention, Flat Cr. watershed (Ark.) 206–208
Prevention Helps Many Watershed Owners, Little Sioux. Harvey R. Lindberg 209–210
Prevention Project, Yazoo-Little Tallahatchie Is a Paying. W. L. Heard 203–204
Prevention Story Gets Southeast Headlines. Walter S. Allen 254
Proofing Pays Off for Indiana Farmers and Their Towns. Kent Alverson 201–203
Florida—
amphitheater for American Passion Play 226
planning agencies use soil data 114
policies covered surface and ground water 64
St. Lucie River watershed benefits increased by citrus irrigation measures 32
wind erosion is widespread 158
Forest Service—
conducts supporting research for RAD 133
cooperated on Buffalo Creek water. (N.Y.) 197
cooperates on flood controls 196
dedicated to building rural resources 86
designed rangeland drill 19
helped provide technical assistance on Yazoo-Little Tallahatchie water. (Miss.) 204
planned recreational facilities for Flat Creek watershed (Ark.) 207
provided technical assistance 4
research workers effective in windbreaks in the Great Plains 162
snow surveys coordinated by SCS 213
watershed research on forested lands rests with 281
Fox, Adrain C.: Review of Our Natural Resources 288
Fox, Lester: Fun for 100 Maine Families in Conservation Farmer's Woodland 94–95
Fox, Ray and Bob, stopped wind erosion (Ill.) 165
Francis, C. J.: Earthmoving Is Big Part of Soil and Water Conservation. With Sellers G. Archer 243–245
Franklin, Alex: California Urbanization Spurs Citrus Land Shifts—Conservation. With Bob Richardson 80–81
Franklin, George B., converted cropland to income-producing recreation areas (La.) 136
Freeman, Orville L.—
Excerpts from "A Place to Live," *The Yearbook of Agriculture* 132–133
Land Today Has New Values (Excerpts from address before NACD, Kansas City, Mo.) 235
"Let Us Vote for Grass and Water." 85–86
Fulton, Donald H.: Utah Rancher Gets Results With Conservation Program 5–6
Fuss, Franklin, farm for city vacationers 222
Gaskell, Luther J.: Native Pecans Paying Crop for Farmers. With F. DeWitt Abbott 34–35
Gault, George, started alfalfa and grass on his dryland farm (Wash.) 54
Geological Survey, U.S.—
found water table dropping in rice farming area (Ark.) 276
information adaptable for watershed 281
snow surveys coordinated by SCS 213
Georgia—
basal-planting method 10
Conservation Farm, Bobwhites Draw City Hunters To. R. Hoke Smith 93–94
Conservation Farm Lake Serves People of Four Counties. Walter S. Allen 178–179
Coosa River watershed 196
destructive wind forces in Coastal Plain 158
fishing big business 187–188
grows flue-cured tobacco 139
machinery operating efficiency increased 24 percent with parallel terraces 249
policies covered surface and ground water 64
Rev. Curtis Tillman, District Profile 237
Gibson, Gordon: Conservation Planning Brings Community Cash—Better Living. With C. R. Patton 127–128
Gilliam, J. W.: District Cooperator's Home Pond Movie. With R. R. Kirby 140
Girl Scout Cookies Help Build "Sweetest Lake in the World. J. R. Sasser 236–237
Gleue, Fred C.: "Grass Farm" Is Model for Best Use of Kansas Lands 20–21
Golf Course—Homesite Developer Revamped Plan to Fit the Land. Roy C. Anderson 107
Goode, James P., established bermudagrass through irrigation (Tex.) 269
Grammer, Ray and Claudern, bolster economy with apple and peach business (Ill.) 27–28
Grape Growers—Areas Gain From Conservation. John D. Kiehle and W. A. Mason, Jr. 36–37
Grass(es)—
and livestock (Wyo.). Cover picture /2/
and Water Let Us Vote for. Orville L. Freeman 85–86
Arshade bristle, grows in shade (Fla.) 32
beach, stabilizes sand dunes (Mich.) 157
bermuda and Pensacola bahia (Ga.) 94
Changes the Southeast. Leon J. Sisk 8–9
Coastal bermuda in saline soils (Tex.) 270
cordgrass stopped wave action (Del.) 238
Dwarf orchard, new variety (Utah) 38
Farm Is Model for Best Use of Kansas Lands. Fred C. Gleue 20–21
Italian rye aerial seeded (Ohio) 24
meant more cattle (Wash.) 54
mixtures used in orchard (Ill.) 27
native range (Colo.) 13
orchard seeded to legumes and (Va.) 139
reed canary, protects watershed (Iowa) 7
reseeding of rangland most extensive GPCP practice 149

Grass(es)—Continued Page
reseeding on range (Utah) 6
Seed, Ponies, and Conservation. Lyman E. Ellsbury 22–23
seeded on basal strip (Ga.) 10
sods effective improving soil structure 41
soil tilth improved by planting (Utah) 63
tall fescue effective on N.C. tobacco land 139
Graves, Robert, Elvin, and Matt, have long-range conservation plan for orchard 138
Grazing Assoc. profits from GPCP (Colo.) 12
Great Plains—
Conservation Program—
cost-share helps rangeland brush control (Tex., Okla.) 18
grazing association land developed through (Colo.) 12
increased demand for grass seed (Wyo.) 23
progress fiscal 1963 233
proved wind erosion measures 154
provided financial assistance in conservation on saline soils (Tex.) 269
reduced wind and drought damage by cropland conversion (Colo.) 168
Represents Good Soil Stewardship. Roland Willis 223–224
speeded up land conversion to grass 235
Prairie States Shelterbelt Project for the 160
Profits in '60's From "Dust Bowl" of the 30's. Cy Luker 147–149
Grizzell, Roy A., Jr.: Minnow Farming Expands as Land Use in Arkansas 284–285

Halloran, Arthur F.: Conservation Increased Feed for Hungry Teton Elk Herd. With Roy H. Buchmeier 180–181
Herbert, Fred, orchardist changed to cover 45
Harper, Frank B.: Review of the Care of the Earth 264
Haskell, Louis, helps conceive step dam 286
Hatch, W. Bradford: Utah Irrigation Area Profits From Modern Soil-Water Management. With Clifford L. Merrill 62–63
Hawk, Virgil B.: Crownvetch Rewards Skill, Care in District Seed Plot. With George P. Thorburn 268
Healey, Lynn R.: Conservation—Not More Land—Fills Coloradan's Income Needs 126
Health, Education, and Welfare, U.S. Department of—
cooperates on flood control 196
developed soil percolation tests (Ill.) 111
Heard, W. L.: Yazoo-Little Tallahatchie Is a Paying Flood Prevention Project 203–204
Herting, G. Claire: Watershed Land Treatment Boosts Community Income. With I. B. Stafford 3–5
highways, basal-planting method used on (Ga.) 10
Holland, Jimmy: Alabama Brothers Switch Farm From Row Crops to Recreation. With Walter S. Allen 173–175

Hooker, Frank, orchardist makes money on cover crop (Oreg.) 47
Housing and Home Finance Agency, money used for soil surveys 75
Hubbard, Leon R.: Steel Barrel Risers Cut Cost of Underground Irrigation System 67–68
hydrologic cycle 51

Ice, Paul W.: Conservation Is Helping Family to $500,000 Orchard Income 27–28
Idaho—
cattle company's operations 16
Plant Materials Center developed Dwarf orchardgrass 39
snow surveys made in 213
Illinois—
Ela Township, Lake County, asked SCS help with soil survey 103
Ela township one of first to cost-share survey 76
fruit orchard turned into berry farm 39
Grammer apple and peach business bolsters local economy 27
Hadley Creek watershed benefits all 260
health official finds soil surveys report useful for septic tank installation 110
Lake County SC&WD, one of last formed 116
Long Grove County Club Estates example of changing pattern of land use 107
1961 wind storm cost thousands 164
Planning Commission published soils report based on generalized soil maps 114
recreation. Cover picture [98]
soil survey helps Ela Township Lake County in urban expansion problems 99
urbanization causes sewage prob. (Ill.) 113
Indiana—
Elk Creek watershed project first completed in State 201
roads blocked by water from record rains 255
Iowa—
Farm Family Scores Par in Converting to Golf Course. J. Dale Schott 86–87
Keokuk County Farm, Emerald crownvetch 268
Little Sioux prog. profiting 75 landowners 209
Little Sioux watershed 196
Little Sioux watershed protected by Reed canarygrass 7
parallel terraces. Cover picture [74]
Irrigation—
Basin, System Stops High Pumping Costs. John Colvin, Jr 258–259
canal linings for (Utah) 283
concrete, ditches for orchard (Utah) 38
Ditch, Rubber Tube Solves Seepage Problem. H. W. Riek 246
Farmers Restore Alkali Lands. Norris A. Mathey 142–143
in orchard management (W. Va.) 45
increased quality of winter feed (Idaho) 17
land (Utah) 6

Irrigation—Continued Page
"moisture accounting" method for (Va.) 69
of saline soils grow bermudagrass (Tex.) 269
on 317 converted acres (Wyo.) 23
ponds for orchard (Va.) 139
Rice, Reservoirs Help Meet Water Needs and Aid Economy. William B. Davey 276–277
structure to replace Tovera flume (Colo.) 56
System, Steel Barrel Risers Cut Cost of Underground. Leon R. Hubbard 67–68
systems cost-share by GPCP 149
water costs increased by following operating rules but crop returns greater (Utah) 63
water from permanent pumping plants for orchards (Fla.) 33
water from pond (Calif.) 22

Jackson, Howard C.: District Farmers Profit When St. Louisians "Go Fishing for Fun" 92
Johnson, Calvin B., farm recreation (Maine) 94
Johnson, J. A.: Southeastern States Move Out on Surface—Ground Water Problems 64–65
Johnson, Leslie E.: Five Kansas Watershed Projects Joined in Flood 205–206
Johnson, Vernon E.: Metropolitan East Has Wind Erosion Too. With John A. Krohn 150–151
Jones, Floyd, takes in city vocationers to aid to income (Ohio) 221

Kansas—
Conservation Farmers, Native Pecans Paying Crop for. F. DeWitt Abbott and Luther J. Gaskell 34–35
farmwork of Republic County SCD 20
field windbreak planting active in 160
Universal wind erosion equation 154
uses snow survey information 213
watershed Lake Gives Up Record Bass. Elbert L. Bell 189–190
Watershed Projects Joined in Flood—Other Benefits. Leslie E. Johnson 205–206
wind erosion not as serious in 1950 152
Karren, Bill, reseeds range (Utah) 5
Kellogg, Charles E.: Soil Surveys Help People Make Their Land What They Wish 105–106
Kelly, L. L.: Watershed Research Seeks Ways to Improve Planning 281–282
Kentucky—
planning commission to provide soil maps 75
policies covered surface and ground water 64
reported 3,000 persons evacuated from homes after record rains 255
Kidd, Garland J.: Orchardist Brothers Combine Conservation—Marketing Tricks 138–139
Kiehle, John D.: Grape Growers Gain From Conservation. With W. A. Mason, Jr 36–37
Kilmer, W. H., orchard operated on soil and water conservation plan (W. Va.) 44
Kirby, R. R.: Home Movie Shows How to Build Pond. With J. W. Gilliam 140
Kline, Donald D.: It's Maple Syrup Time Again! With Marvin F. Bureau 175–177
Klingebiel, A. A.: Soil Surveys "Move To Town" 119–120
Krohn, John A.: Metropolitan East Has Wind Erosion Too. With Vernon E. Johnson 150–151
Kuder, Homer M.: Wind Erosion Growing Menace to Illinois Farms and Roads 164–165

Land, A. T., Sr., offers conservation lake and lodge to town and country group (Ga.) 178
Land—
changing pattern (Ill.) 107–110
conversion in Great Plains (Tex.) 223
conversion reduced wind and drought (Colo.) 168
converted for recreation (Ohio) 82–83
converted from cropland to grass (Wyo.) 23
converted from orchard to berry farm (Ill.) 39–40
converted from wheat to hay, pasture, (Calif.) 21
converted to golf course (Iowa) 86–87
converted to pecan industry (Fla.) 34–35
Grading Raises Yields and Benefits Rural Economy. Robert H. Landers 261–262
Improvement Contractors Bring New Know-how to Conserv. Work. Leonard Morris 256
leveling and grading of irrigated cropland 245
leveling to proper grade, Delta district (Utah) 283
shift from farming to residential, industrial, and recreation (Ill.) 103
shift to orchards (Calif.) 80
Today Has New Values (Excerpts from address before NACD, Kansas City, Mo.). Orville L. Freeman 235
use pattern change, Elk Creek watershed (Ind.) 202
use shift from dairying Marshland and French Creek watersheds (Wash.) 211
Water—People. Donald A. Williams 84
Landers, Robert H.: Land Grading Raises Yields and Benefits Rural Economy 261–262
Large, Ben, Jim, Sam, ranch operation 16
Larsen, Clyde W.: Conservation Saves Farmers' Water in Drought Counties 283–284
Larson, Joe: Review of Trends in Natural Resources Commodities 192
Lee, Robert E.: Kickapoo Conservation Orchards Bring People and Money to Valley, With Arthur J. Mundson, Jr 56–57
Legg, Jim, successful tree planting (Wyo.) 287
Legume, Emerald crownvetch (Iowa) 268
liabilities and responsibilities in dam building 279–280
Lindberg, Harvey R.: Little Sioux Flood Prevention Helps Watershed Landowners 209–210
Little, W .C.: Cost of Parallel Terraces Depends Largely on Amount of Earthmoving 249–250
Long, Hampton H.: "Watershed Philosophy" Spreads Along Hadley Creek 260

Page

LONZWAY, ROBERT R.: New Orchard for Old Pays Off for Oregonian 47
LOBEEN, EVERETT: Farmers Solving Problem of Too Much Water. With Herb Boddy 211–212
Louisiana—
company offers recreational facilities 131
Cotile Reservoir, one first cost-sharing for recreational benefits 285
declaration applied only to surface waters 64
elementary education class tied soil conserv. to subjects in elementary grades 262
farm carried 82 head on Coastal bermuda 9
farm converted for fishing and hunting as pilot project in Cropland Conversion 136
land-leveling method for riceland 257
Upper West Fork Cypress Bayou watershed protects town from floods 254
LOWE, CLYDE T.: Fruits of Conservation 38–39
LUKER, CY: Great Plains Profits in '60's From "Dust Bowl" of the 30's 147–149

MACE, BEN: Right Equipment Helps District Do Efficient Conservation Job 141
Maine—
farm recreational development stimulated community economy 94
maple syrup income 175
Maple Syrup Time Again. Donald D. Kline and Marvin F. Bureau 175–177
MARRERO, J. F.: Conservation Helps Bring Back Puerto Rico's Coffee Production 42–43
MARSHALL, R. M.: Soil Surveys Are Guides for Many Urban-Area Developments 75–77
Maryland—
maple syrup income 175
Potomac watershed 196
MASON, W. A., JR.: Grape Growers—Areas Gain From Conservation. With John D. Kiehle 36–37
Massachusetts—
Campers Learn About Resources—Conservation. Bernhard A. Roth 177–178
Hanover, helped by soils information 128
maple syrup income 175
Middlesex SCD objectives 274
wind erosion controlled in Connecticut River Valley 150
MATHEY, NORRIS A.: These Irrigation Farmers Restore Alkali Lands 142–143
MCCLURE, WILLIAM T., JR.: Building a Floodwater-Retarding Dam. (Picture story.) 252–253
McCord, R. B., and William Fornter work by a farm conservation plan (Mo.) 261
Meier, Josef, produces American Passion Play 225
MERRILL, CLIFFORD L.: Utah Irrigated Area Profits From Modern Soil-Water Management. With W. Bradford Hatch 62–63
Merry, Clayton, includes recreation and wildlife to cattle ranch (Wash.) 185–186
Michigan—
It's an Ill Wind That Blows No Good, in Western. William M. Allred 157–158
maple syrup income 175
planning agencies use soil data 114
MILLS, ROBERT H.: Cover Crop Seeding From the Air 24
Minnesota—
Farmers Develop Water for Recreation and Wildlife. Hans G. Uhlig 65–66
Little Sioux Flood Prevention project 209
Little Sioux watershed 196
maple syrup income 175
Red River Valley licking wind erosion 163–164
Stevens Co. SCD program 275
stripped cropped farm. Cover picture [50]
Minnow Farming Expands as Land Use in Arkansas. Roy A. Grizzell, Jr 284–285
Mississippi—
Delta farmer says bahia carries more cattle 8
Little Tallahatchie and Yazoo watersheds 196
policies covered surface and ground water 64
Turkey Creek water protects town and bottom land from flooding 254
Yazoo-Little Tallahatchie watershed economic revolution 203
Missouri—
Excerpts from address by Secretary Freeman before NACD, Kansas City 235
had disaster crews lead residents from rain-swollen Black River 255
more emphasis on good land preparation 261
St. Louisians fish in ponds and lakes of 20 district cooperators 92
"Moisture Accounting" Method for Irrigation Tobacco Growers. Sam Cole 69–70
MOLINAROLI, REMO: City and County Plan Ahead to Meet Urbanization Problems 78–80
Montana—
Box Elder Creek watershed provides flood protection and dam for fish and wildlife 251
rubber tube carries water on unstable soil 246
snow surveys made in 213
wind erosion controlled by conservation farming. Cover picture [146]
MORRIS, JOHN G.: Official Says Soil Survey "One of the Most Useful Tools" 110–113
MORRIS, LEONARD: Land Improvement Contractors Bring New Know-how to Conservation Work 256
mulch tillage to break the wind (S.C.) 160
MULVANEY, F. E.: Pay-As-You-Shoot Hunters Pay Off for New York Farmer 190–191

National Park Service snow surveys coordinated by SCS 213
NAUSS, MRS. JAMES: Women See Where Food Comes From 96
Nebraska—
field windbreak plantings active in 160
Johnson Co. SCD objectives 275
Little Sioux Flood Prevention project 209

Nebraska—Continued Page
Soil Mechanics Laboratory tests thousands of soil samples 247
uses snow survey information 213
rancher used new "barrel" riser technique 67
Nevada—
snow surveys made in 213
NEWBURY, RAYMOND L.: Ela Township Planning Involves 119 Soils. With William H. Bender 103–104
New Jersey—
farmers keeping at their windbreak plantings 150
streambank stabilization, study, Pequest River 199
New Mexico—
ground water removed from 25,000 acres in High Plains 52
snow surveys made in 213
Taos Co. SCD program 278
New York—
bedded lands producing bromegrass, alfalfa, and birdsfoot trefoil mixtures 58–59
Buffalo Creek watershed 196
Buffalo Creek watershed first completed 197–199
Farmers, Pay-As-Shoot Hunters Pay Off for. F. E. Mulvaney 190–191
Great Brook watershed 3–5
heavy precipitation covered band from 150 miles wide from northeast Missouri to 255
maple syrup income 175
Monroe County SCD accelerating soil survey 76
stabilizing streambanks, Buffalo Creek 199
turned to modern techniques in grape culture 36–37
North Carolina—
Hoke County, wind erosion caused replanting 158
policies covered surface and ground water 64
tobacco following fescue 8
Tobacco Growers Like Tall Fescue in Rotations. W. W. Stevens 139–140
Town Fork Creek 254
North Carolina—
trout fishing big business 187–188
water ski show promoted for Town Fork Creek watershed 134
North Dakota—
floods on Red River of the North. Cover picture [194]
Red River Valley licking wind erosion 163–164
shelterbelt plantings 160
single-row, windbreaks 61
universal wind erosion equation 154
uses snow survey information 213

ODELL, H. H.: Conservation Farm Pond Water Used to Fight Mill Fire 70–71
OFFERMAN, ELMER E.: Conservation District Program Serves Rural and Urban People 116–118
OGROSKY, H. O.— Page
Electronic Computers Join SCS Team in Planning for Watershed Protection 272–273
Was the Ohio Flood Necessary 255–256
Ohio—
farmers organized Vacationland Association 221
farmers set new records in cover cropping 24
Farmland Is Converted to City People's Playground. Water H. Dove 82–83
fresh water from 400 spring developments 68–69
maple syrup income 175
peaches planted on terraces 46
Planning Commission published report on soil maps 114
River floods not to be prevented by small watershed projects 256
Oklahoma—
Double Creek 205
has 0.6 million acres of rangeland brush 17
uses snow survey information 213
Washita watershed 196
Orchard(s)—
Brothers Combine Conservation—Marketing Tricks. Garland J. Kidd 138–139
concrete irrigation ditches for (Utah) 38
cover cropping floor of (W. Va.) 45
"Hedging" trees for canopied grove (Fla.) 32
Income Goal, Conservation Is Helping Family to $500,000. Paul W. Ice 27–28
Kickapoo Conservation, Bring People and Money to Valley. Robert E. Lee and Arthur J. Amundson, Jr 56–57
Ladino clover cover crop (Calif.). Cover Picture [26]
management of dwarf-type apple trees (W. Va.) 44
New, for Old. Robert R. Lonzway 47
peach planted on terrace crown (Ohio) 46
pecan growing industry (Kans.) 34
Timing, Peach, Cover Crops to Cut Down Moisture Competition. C. S. Britt and R. R. Robinson 41–42
Wenatchee, Take To Cover. Photo picture story by David E. Roch 48
Oregon—
materials testing section of SCS 247
orchard rebuilt by subsoiling old ground 47
ranchers clearing 200,000 acres of juniper 19
snow surveys made in 213
OSBORN, BEN: Review of Land for Americans 288

Palouse Farmer's Alfalfa-and-Grass Saves Moisture. Stanley Bannister 53–54
Passion Play Director Also Good Soil Steward. Perry Eberhart 225–226
Pastures, Seepy, Springs Pay Off for Ohio Farmers. Adrian Achtermann 68–69
PATTON, C. R.: Conservation Planning Brings Community Cash—Better Living. With Gordon Gibson 127–128

Pennsylvania— Page
conservation at home project 245
maple syrup income 175
Northumberland Co. SCD program 275
Potomac watershed 196
soil survey of Montgomery County 76
Perkins, Irving, developing land for wildlife (Wis.) 182
PETERSON, E. J.: Review of Careers in Conservation-Opportunities in Natural Resources 144
PHILLIP, BILL: "Step Dam" Builds Self and Stops Gully With Sediment 286–287
picture story on cover crop seeding (Ohio) 24
Plant(s)—
as intermediate windbreaks (N.C.) 159
citrus expansion (Calif.) 80–81
Material Center furnished Emerald Crownvetch seed (Iowa) 268
Pond(s)—
Conservation Farm, Water Used to Fight Mill Fire. H. H. Odell 70–71
constr. recorded by movie camera (Tenn.) 140
Farm, in Smokies' Shadow Yield Trout for Fun and Profit. Sellers G. Archer 187–188
for wildlife (Wis.) 182
provide water for orchard spraying (Ill.) 27
Profile, district—
Rev. Curtis Tillman of Georgia. Walter S. Allen 237
Klubert Warembourg of Colo. 137
Public Health Service, U.S., pointed out urban population has aggravated environmental problems (Ill.) 110
Puerto Rico cultural practices promise to restore coffee to a leading position 42

QUAY, JOHN: Lake County Uses Soil Survey in Planning Its Urban Areas 99–102

Rabideau, Philip, established interceptor and surface ditch system (N.Y.) 58
RAMSEY, N. L.: Bird Feeding Leads Virginian into Hunting Lodge Business 183–184
Reclamation, U.S. Bureau of—
cooperates on flood control 196
snow surveys coordinated by SCS 213
Recreation—
area extended by Bond Creek watershed, (W. Va.) 90
area Big Sandy watershed (Colo.) 213
at Camp Elbanobscot (Mass.) 177
bobwhite quail-hunting paying bus. (Ga.) 93–94
bonus to orchardist (Va.) 139
Box Elder Creek watershed first in Montana for cost-share 251
Clarks converted part of farm to golf (Iowa) 86
cost-sharing Flat Creek watershed, Lake Charles (Ark.) 207
cover picture. (Colo.) [170]
cover picture. (Ill.) [98]
Recreation—Continued Page
development stimulated community (Maine) 90
Ela Township, Lake County, (Ill.) 103–104
fishing good in Hadley Creek water. (Ill.) 260
fishing growing into business (N.C.) 187
fishing program (Mo.) 92
gamebird hunting business (Va.) 183–184
golf course on abandoned farm (Va.) 90
Has Important Post in Land's Use and Conservation. Donald A. Williams 171–173
hunting pays on farmland (N.Y.) 190–191
in 5 Caney watershed projects (Kans.) 205
in Little Sioux Flood Prev. proj. (Iowa) 210
in Logan County, Ohio 82
income-producing area (La.) 136
income-producing cattle ranch (Wash.) 185
income on farms from vacationers (Ohio) 221–222
Jobs, "Hi Neighbor!" Company's Key to Conservation. Chester Bellard 131
Long Grove Country Club Estates basic layout changed by soil information (Ill.) 117
on Aiken Creek watershed lake (Kans.) 190
on banker's conservation lake (Ga.) 178–179
on Cotile Reservoir, Bayou Rapides (La.) 285
on Great Brook watershed (N.Y.) 5
outdoor needed 85
pheasant raising hunting profitable (Wis.) 182
pond stocked for fishing (Ill.) 27
possibilities on Town Fork Creek (N.C.) 134–135
progress, fiscal 1963 227–229
row cropland converted to paying (Ala.) 173–175
saturation point and carrying capacity 271
7,000 acres of value to (Minn.) 65
soils data used in combination golf course and homesite development (Ill.) 102
threatened by beach erosion (Del.) 238–239
urban land changed to golf course and homesite (Ill.) 107–110
Research Series—
No. 71. Timing Peach Orchard Cover Crops to Cut Down Moisture Competition. C. S. Britt and R. R. Robinson 41–42
No. 72. Our Soil-Moisture Reservoir. Cecil H. Wadleigh 59–60
No. 73. Wind Erosion Laboratory Finds Answers. N. P. Woodruff 152–154
No. 74. Research Seeks Best Techniques for Stabilizing Stream Channels. Robert P. Apmann 199–201
No. 75. Cost of Parallel Terraces Depends Largely on Amount of Earthmoving. W. C. Little 249–250
No. 76. Watershed Research Seeks Ways to Improve Planning. L. L. Kelly 281–282
Resource Conservation and development projects—
authorized by Food and Agriculture Act 235
challenge to conservation planning 125
enable people to work together 84
offer possibilities for recreation 172
progress, fiscal 1964 229
will enable people to work together 85

Review(s)— Page
The Care of the Earth. By Russell Lord 264
Careers in Conservation—Opportunities in Natural Resources. Edited by Henry Clepper 144
The Dark Traveler. By Josephine W. Johnson 192
Land and Water Use. Edited by Wynne Thorne 143–144
Land for Americans. By Marion Clawson 288
Our Natural Resources, 2d Ed. By P. E. McNall 288
Report on the Lands of the Arid Region of the United States. By John Wesley Powell. Edited by Wallace Stegner 72
Soil Conservation in India. By M. S. V. Rama Rao 71–72
Soil Conservation in South Africa. By J. C. Ross 240
Trends in Natural Resources Commodities. By Neal Potter and Francis T. Christy, Jr. 192
Rhode Island townships obtained soil maps of community land from SCS 224
Richardson, Bob: California Urbanization Spurs Citrus Land Shifts—Conservation. With Alex Franklin 80–81
Riek, H. W.: Rubber Tube Solves Seepage Problem in Irrigation Ditch 246
risers, steel barrel, technique 67–68
Rittberger, Rudolph, showplace (S. Dak.) 166
River Basin Surveys, progress fiscal 1963 233
Roach, David E.: Wenatchee Orchards Take to Cover 48
Robertson, E. C., takes movie of pond construction (Tenn.) 140
Robinette, Mrs. Gladys, developed conservation wise use in elementary education 262
Robinson, R. R.: Timing Peach Orchard Cover Crops to Cut Down Moisture. With C. S. Britt 41–42
Rogers, Hal L.: Better Cattle Not More Cattle Is Ranchers' Goal 16–17
Roth, Bernhard A.—
Colonial Town Uses Soil Survey in Planning for Today's Growth 128–130
Massachusetts Campers Learn About Resources—Conservation 177–178
Soil Surveys for Good Soil Stewardship 224–225
West Virginia Watershed Project Ups Farmers' Income—Town's Economy 90–91
Rural Areas—
benefit from rice irrigation reservoirs (Ark.) 276
Carroll County's homemade program (Va.) 88
development—
because of Yazoo-Little Tallahatchie watershed (Miss.) 204
benefits—
Elk Creek watershed (Ind.) 203
farmers and urbanites (W. Va.) 90
from Big Sandy watershed (Colo.) 215–216
Rural Areas—Continued
development—Continued Page
berry farm makes use of extra help (Ill.) 39
best working example set in Great Plains 149
by Little Sioux project (Iowa) 210
for sound economic development 173
from Marshland and French Creek watersheds (Wash.) 212
includes 37 services 133
is on move 235
Kickapoo, orchards attract tourists 56
program—
small watershed program illustrates idea of 84
to revitalize and recapitalize town and country 132
progress, fiscal 1963 229
Town Fork Creek watershed (N.C.) 135
to protect resources 85
twist to farming (Ala.) 173
Utah Delta area farm income increased from modern conservation practices 62
economy benefited by land grading (Mo.) 261
economy bolstered by apple and peach business (Ill.) 27
helps by additional employment and income from pecans (Kans.) 34
Rural Electrification Administration, RAD program involves industrial loans through 85
Rural Renewal Projects—
area in disadvantaged areas 84
designed to attack entrenched poverty 85

Sand Dune(s)—
stabilization by beachgrass (Mich.) 157
stabilization wind erosion control (N.J.) 151
Sasser, J. R.: Girl Scout Cookies Help Build "Sweetest Lake in the World" 236–237
Schott, J. Dale: Iowa Farm Family Scores Par in Converting to Golf Course 86–87
sediment estimates likely to be produced by a watershed hard to predict 281
Sewage Disposal System(s)—
because of urbanization (Ill.) 113
soil maps used to determine soil suitability for (Ill.) 11
Shannon, William G.: Snow Survey Reports Help West in Years of Flood or Drought. With R. A. Work 213–215
Shelterbelt(s)—
studied in laboratory (Kans.) 153
What Happened to the. A. E. Ferber 160–162
Shipp, Ralph: District Profile, Klubert Warembourg 137
Silkett, Val W.: Today's Conservation Planing Is Shaped to Broadened Needs 123–125
Simms, D. Harper: Review of the Dark Traveler 192
Sisk, Leon, J.: Grass Changes the Southeast 8–9
Skaife, Charles W.: He Holds Water on the Land for the Sake of Wildlife 182–183

SMITH, GORDON S.— Page
Del. Beach Owner Stops Waves' Damages 238–239
Farm-City Teamwork Boosts Virginia Rural Area's Economy 88–90
SMITH, R. HOKE: Bobwhites Draw City Hunters to Georgia Conservation Farm 93–94
Snow Survey Reports Help West in Years of Floods or Drought. R. A. Work and William G. Shannon 213–215
SNUSTAD, NELS: Lick Wind Erosion for Red River Valley. With H. A. Vedtin 163–164
So, FRANK S.: Urban Growth Spurs Planners to Look for Basic Land Facts 113–116
Soil(s)—
cement lining (Calif.). Cover picture [242]
conservation technician. Cover picture [266]
Ela Township Planning Involves 119. Raymond L. Newbury and William H. Bender 103–104
facts can be learned from soil maps 119–120
found salty in Utah Delta area 62
Management Helps West Virginia Apple Grower. James H. Conklyn 44–45
maps prepared for 35 farms (Tenn.) 127
Mechanics Tests Guide Design of Earth Structures. Rey S. Decker 247–248
Saline, to Grow Pasture Grasses, Conservationists Find Way to Irrigate. Edward E. Thomas 269–270
stewardship—
followed by Lubbock farmers (Tex.) 224
today based on soil surveys (Conn., R.I.) 224
Week. Donald A. Williams 219–221
stewards' spiritual values prominent (Wis.). Cover picture [218]
Soil Conservation District(s)—
Cooperator's Home Movie Shows Neighbors How to Build Pond. J. W. Gilliam and R. R. Kirby 140
Erie and Wyoming County provided easements and rights-of-way, Buffalo Creek (N.Y.) 199
farmers with 8 varieties of grass (Kans.) 20
farmers and ranchers began organizing under State enabling acts in 1937 123
farmers and ranchers donated damsites and flowage rights to Big Sandy (Colo.) 213
Farmers Profit When St. Louisians "Go Fishing for Fun." Howard C. Jackson 92
first farm plan marker (S.C.) 135
4-county New River, offered services through SCS in making soil surveys (Va.) 88
furnish leadership in GPCP 223
Hardeman Co. and Northeast Miss. sponsored Porters Creek project (Tenn.) 236–237
helped develop wind erosion program (Mass.) 150
In Conservation, Revised Programs Show Expanding Role of. John W. Barnard 274–75, 78
Kansas-Oklahoma Caney Council for Caney River Basin 205
Soil Conservation District(s)—Continued Page
Pine River assigned top priority to water conservation 55
Polk County helped in golf course conversion 86
Program Serves Rural and Urban People. Elmer E. Offerman 116–118
progress, fiscal 1964 229–231
provide leadership for shifting land to better uses 235
Sheridan County sponsored Box Elder Creek watershed project (Mont.) 251
Snohomish sponsor Marshland and French Creek watersheds (Wash.) 211
sponsored Yazoo-Little Tallahatchie watershed (Miss.) 203
Stokes County and Tri-Creek sponsored water ski shows (N.C.) 134
12 concerned in carrying out Little Sioux program (Iowa) 209
Wash. County participated in Elk Creek watershed (Ind.) 201
West Ottawa and N. and S. Muskegon County organization prompted (Mich.) 157
Soil Conservation Service—
administers the Great Plains Conservation Program 223
asked for help with soil survey by Ela Township, Lake County (Ill.) 103
assigned leadership for income-producing recreation activities 172
assistance to ACP cost-sharing, progress, fiscal 1963 231
dedicated to building rural resources 86
devised reservoirs for water's use and reuse in rice-farming area (Ark.) 276
gave assistance in planning, construction Flat Creek watershed (Ark.) 207
helped develop wind erosion program 150
helped provide technical assistance on Yazoo-Little Tallahatchie watershed (Miss.) 204
helps administer technical programs 133
mapped Ela and Vernon Town soils (Ill.) 116–117
prepared soil map for Ela Township (Ill.) 111
provided technical assistance (N.Y.) Great Brook watershed 4
provides technical, financial assistance for flood prevention projects (N.Y., N.J.) 199
supplies technical help through 82 soil and water conservation districts (Minn.) 65
uses research findings in the watershed protection program 281
Soil Survey(s)—
Are Guides for Many Urban-Area Developments. R. M. Marshall 75–77
Basis for Good Soil Stewardship. Bernhard A. Roth 224–225
Colonial Town Uses, in Planning for Today's Growth. Bernhard A. Roth 128–130

Soil Survey(s)—Continued Page
Health Official Says, "One of the Most Useful Tools." John G. Morris 110–113
help in Ela Township, Lake County, urbanization (Ill.) 103–104
Help People Make of Their Land What They Wish. Charles E. Kellogg 105–106
indicate citrus possibilities on land formerly thought unsuitable (Calif.) 80
indicated saline soil problem soils (Tex.) 269
information shows soil heavy textured (Colo.) 126
information used in Carroll County rural area development (Va.) 88
Lake County Uses in Planning Its Urban Areas. John Quay 99–102
made before grading (Mo.) 261
made by SCS of Ela and Vernon townships (Ill.) 116
map useful to golf course-homesite developer (Ill.) 108
Move to Town. A. A. Klingebiel 119–120
progress fiscal 1963 233–234
showed land suited for wildlife (Wis.) 182
Southeastern States Move Out on Surface—Ground Water Problems. J. A. Johnson 64–65
South Carolina—
benefits from soil survey, Charleston 106
Charleston, drainage feasibility study 78
destructive wind forces in Coastal Plain 158
farm pond used in mill fire 71
grows flue-cured tobacco 139
machinery operating efficiency increased 24 percent with parallel terraces 249
materials testing section of SCS 247
picture story of building floodwater-retarding dam 252–253
policies covered surface and ground water 64
turned to modern techniques in grape culture 36–37
American Passion Play in Black Hills 225
South Dakota—
shelterbelt plantings 160
snow surveys made in 213
soil conservation measures defeat drought 166–167
Stadelbacher, Leo and family turn orchard into berry farm (Ill.) 40
Stafford, I. B.: Watershed Land Treatment Boosts Community Income. With G. Claire Herting 3–5
Stafford, Irving B.: Buffalo Creek First of 11 Early Flood Prevention Projects Done. With Adelbert D. Ward 197–199
Steger, Don, pay-as-you-shoot business 190–191
Stevens, W. W.: North Carolina Tobacco Growers Like Tall Fescue in Rotations 139–140
Stewart, K. V., Jr.: Water Leveling Lousiana Riceland Saves Labor and Irrigation Water 257–258
Stripcropping— Page
farm. (Minn.) Cover picture [50]
studied in laboratory (Kans.) 153
to offset fall plowing (Ill.) 165
(Wash.) Cover picture [122]
wind successfully 159
structures, engineering, tested through research 282
Stuart, Victor, converts wheat ranch to cattle 21
Stubbe, Gordon F.: Washington State Rancher Adds Recreation and Wildlife 185–186
stubble mulch tillage stimulated by GPCP 149
Tabor, Paul: Basal Plantings Healing Road Cuts Nature's Way 10–11
Tennessee—
Chester Co., SCD use movie of pond construction 140
Coosa River watershed 196
Hancock County valley residents formed Vardy Community Improvement Club 127
legislature passed a water withdrawal act 64
Porter's Creek lake built by Girl Scout cookies 236–237
Terrace(ings)—
parallel (Iowa). Cover picture [74]
Stop "Wet Feet" in Ohioan's Peach Orchard. Earl P. Carlton 46
Texas—
benefits from soil survey, San Antonio 106
farmer established bermudagrass through irrigation 269
farmers using wind erosion information 154
ground water removed from 25,000 acres in High Plains 52
has 28.5 million acre rangeland brush 17
Lubbock farmers developed conservation plans under GPCP 223
materials testing section of SCS 247
middle Colorado River watershed 196
Panhandle shelterbelt plantings 160
planning agencies use soil data 114
Trinity and Washita watersheds 196
uses snow survey information 213
women's tour sponsored by Coastal SCD 96
Thomas, Edward E.: Conservationists Find Way to Irrigate Saline Soils to Grow Pasture Grasses 269–270
Thomas, Mrs. Charles R., relied heavily on precise soils information (Mass.) 128
Thorburn, George, P.: Crownvetch Rewards Skill, Care in District Seed Plot. With Virgil B. Hawk 268
Tidwell, Hugh: Cropland Conversion Is Born to Hunters and Fishermen 136
Tillman, Curtis, Rev., of Tennessee, District Profile 237
Tonsfeldt, Wallis R.: Reed Canarygrass Protects Iowa Watershed Structures 7
Tvedten, H. A.: Cover Crops Lick Wind Erosion for Red River Valley Farmers. With Nels Snustad 163–164

Tree(s)— Page
Against the Wind. David W. Despain 287–288
dwarf-type apple orchard (W. Va.) 44
for shelterbelts in Great Plains 160–162
pecan yield best 70 feet apart (Kans.) 34
plantings, Christmas (Mich.) 157
species for windbreaks include green ash, elm, Russian olive 61

Uhlig, Hans G.: Minnesota Farmers Develop Water for Recreation and Wildlife 65–66
Urban(ization)—
area planners use soil surveys 75
drove fruit growers into Riverside County 80
expansion in Hanover (Mass.) 128
Growth Spurs Planners to Look for Basic Land Facts. Frank S. So 113–116
helped by Lake County S&WCD (Ill.) 116–118
helped in Lake County by soil surveys 110–113
in Lake County, helped by soil survey 103–104
landowners helped by SCS soil classification and mapping (Ill.) 106
makes use of soil maps 119–120
Problems, City and County Plan Ahead to Meet. Remo Molinaroli 78–80
service, fiscal 1963 227
soil surveys give firsthand facts about land 108
Utah—
farmers installing irrigation water management practices 283
Irrigated Area Profits From Modern Soil-Water Management. Clifford L. Merrill and W. Bradford Hatch 62–63
orchardist supplies water through concrete irrigation ditches 38
Rancher Gets Results With Conservation Program. Donald H. Fulton 5–6
snow surveys made in 213

Vacation Farms for City People. Adrian Achtermann and Larry R. Decker 221–222
Van Arsdell, Howard E.: Contour Planting—Water Use Serve Florida Citrus Growers 32–34
Vermont, maple syrup income 175
Vineyards—
helped by wind erosion control, Cucamonga 28–30
modern techniques in grape culture 36–37
Virginia—
benefits from soil survey, Fairfax 106
grows flue-cured tobacco 139
Lynchburg, late spring and summer rainfall less than potential evapotranspiration 41
moisture accounting method for irrigation 69–70
orchardist brothers conservation plan 138
planning agencies use soil data 114
policies covered surface and ground water 64
Potomac watershed 196
Rural Area's Economy, Farm-City Teamwork Boosts 88–90
sportsman has a game bird hunting business 183

Wadleigh, Cecil H.: Our Soil-Moisture Reservoir 59–60
Ward, Adelbert D.: Buffalo Creek first of 11 Early Flood Prevention Projects Done. With Irving B. Stafford 197–199
Warembourg, Klubert, of Colorado. District Profile. Ralph Shipp 137
Washington—
alfalfa and grass rotation saved water and controlled erosion, Palouse 53
Farmers Solving Problem of Too Much Water. Everett Loreen and Herb Boddy 211–212
orchardists consider cover crops a must 48
snow surveys made in 213
State Rancher Adds Recreation and Wildlife. Gordon F. Stubbe 185–186
stripcropping. Cover picture [122]
Thurston Co. SCD program 278
Water—
in soil-moisture reservoir 59
interceptor and interceptor system (N.Y.) 58
key to success, Elk Creek watershed (Ind.) 202
Leveling Louisiana Riceland Saves Labor and Irrigation Water. K. V. Stewart, Jr. 257–258
on the Land for the Sake of Wildlife. Charles W. Skaife 182–183
Our Unseen. Donald A. Williams 51–53
reservoirs to hold and reuse water in rice-farming area (Ark.) 276
saved by alfalfa and grass (Wash.) 54
saved by rubber tube on unstable soil (Mont.) 246
seepy areas developed to provide (Ohio) 68
The "Stuff That Keeps Them Going". Warren J. Brown 55–56
Watersheds—
Aiken Creek wildlife values (Kans.) 189
Big Sandy saves flooding and provides recreation (Colo.) 215
Bond Creek, will benefit urbanites as well as farmers (W. Va.) 90
Buffalo Creek, flood, first completed (N.Y.) 197
Community, Dam Helps Cut Fire Insurance. R. M. Dailey 134–135
Elk Creek flood prevention project (Ind.) 201
Flat Creek with return half million a year in benefits (Ark.) 206
Flood prevention projects, fiscal 1963 233
Land Treatment Boosts Community Income. G. Claire Herting and I. B. Stafford 3–5
Large, Dam to Provide Recreation Area. John M. Cross 285
Little Sioux project benefits (Iowa) 210
Marshland and French Creek save in flood damage and increase income (Wash.) 211
Philosophy Spreads Along Hadley Creek and Beyond. Hampton H. Long 260
Pilot Protection Projects, fiscal 1963 233
planning specialists get information by electronic computers 273
Porters Creek district sponsored project (Tenn.) 236

Watershed—Continued Page
Project Protects Montana City Against Floods. Donald J. Anderson 251
projects Bee Creek (Aiken), Twin Caney, Grant-Shanghai, Big Caney, Middle Caney for flood control and multipurpose (Kans.) 205
Protection and Flood Prevention, fiscal 1963 231–233
St. Lucie increased citrus (Fla.) 32–34
Stewart Creek, promises benefits for Carroll County 90
SuAsCo River, resource protection program and recreation (Mass.) 177–178
small, projects, new ways to provide additional needed recreation areas 171
Structures, Reed Canarygrass Protects Iowa. Wallis R. Tonsfeldt 7
Weather Bureau, U.S.—
information for watershed protection 281
precipitation and other reports used by SCS 213
Weimer, Edward R.: Farmers and Conservationists Apply Research Findings 154–155
West Virginia—
Potomac watershed 196
soil management geared to dwarf-type apple trees 44
Watershed Project Ups Farmers' Income—Town's Economy. Bernhard A. Roth 90–91
Wildlife—
Bobwhite quail hunting paying business 93–94
crops planted on former cropland (Ohio) 82
5 million acres developed as cover 85
food and conservation for Jackson Hole Elk Refuge (Wyo.) 180
food patches (N.Y.) 191
habitat plantings on ranch (Wash.) 185
Hungarian partridge nestle in windbreaks 62
gamebird hunting business (Va.) 183–184
large acreages converted under Cropland Conversion Program (La.) 136
pheasant hunting, raising profitable (Wis.) 182–183
Rabbits, quail, and deer on increase, Hadley Creek watershed (Ill.) 260
7,000 acres of value to (Minn.) 65
soils interpreted for their adaptability for growing (Ill.) 104
Williams, Donald A.—
Conservation Technology 267
Land—Water—People 84
Our Unseen Waters 51–53
Recreation Has Important Part in Land's Use and Conservation 171–173
Review of Soil Conservation in India 71–72
Soil Stewardship Week 219–221
Williams, Hollis R.: Arkansas Watershed Team Speeds Flood Prevention and Recreation 206–208
Willis, Roland: Great Plains Conservation Program Represents Good Soil Stewardship 223–224
Wilson, Jay, installed basin irrigation system 258
Windbreak(s)—
hedge stop wind erosion (N.J.) 151
of trees successfully used in 4 States 159
Reduce Evaporation—Hold Snow—Lessen Wind Erosion. Elmer L. Worthington 61–62
throughout Cody S&WCD (Wyo.) 287
to offset fall plowing (Ill.) 165
Wind Erosion—
and drought reduced by crop residues 167
control by pine tree windbreaks (Mich.) 157
control in Great Plains 160–162
Control in Vineyards Helps California's Cucamonga Area. John O. Dean 28–30
controlled by conservation farming. (Mont.) Cover picture [146]
controlled by GPCP 147–149
Growing Menace to Illinois Farms and Roads. Homer M. Kuder 164–165
Laboratory Finds Answers. N. P. Woodruff 152–154
Southeast Borrows From West to Fight Own. Walter S. Allen 158–160
Too, Metropolitan East Has. John A. Krohn and Vernon E. Johnson 150–151
Wisconsin—
farmer developing land for wildlife 182
Kickapoo River Valley orchards create tourist and other business 56
maple syrup income 175
planning commission feels soils information is important in its program 114
Regional Planning Commission uses soil survey 76
soil stewards. Cover picture [218]
Women See Where Food Comes From. Mrs. James Nauss 96
Woodland, Fun for 100 Maine Families in Conservation Farmer's. Lester Fox 94–95
Woodruff, Charles B., Jr.: "Bedded" Lands Solve New Yorker's Hay Problem 58–59
Woodruff, N. P.: Wind Erosion Laboratory Finds Answers 152–154
Work, R. A.: Snow Survey Reports Help in Years of Floods or Drought. With William G. Shannon 213–215
Worthington, Elmer L.: Windbreaks: Reduce Evaporation—Hold Snow—Lessen Wind Erosion 61–62
Wyoming—
acreage used to grow certified grass seed 22
food for Jackson Hole Elk Refuge 180
grass and livestock. Cover picture [2]
ranchers plant windbreaks 287
snow surveys made in 213

Young, Gladwin: Floods Are Being Prevented Watershed by Watershed 195–197

Ziegler, George, leveled land (Ariz.) 142

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Soil Conservation

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SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

VOL. XXIX, NO. 1 AUGUST 1963

Soil Conservation *25 Years Ago*

"Immediately after an area is selected for demonstration purposes, a project work plan is developed. In this planning, all available physical and economic data are studied. The extent of different types of erosion in relation to slopes, soil types, and land use is determined by means of conservation surveys. Data on the land-use distribution to crops, pasture, range, and woods, are obtained. . . .

"Often, in developing the project plan, individual farms are analyzed to determine what vegetative covers and cultural practices have furthered conservation, or allowed erosion. Cropping and fertilization practices are studied. Factual data concerning the kinds, types, and numbers of livestock, as well as the market distribution of livestock and their products, are considered. In this field, the dominating feeding and grazing practices are important. And once each distinct factor is considered in the light of other related factors, and all the information synthesized, a basis is obtained for the development of sound and coordinated project plans."

CONTENTS

Page

3 Watershed Land Treatment Boosts Community Income
By G. Claire Herting and I. B. Stafford

5 Utah Rancher Gets Results with Conservation Program
By Donald H. Fulton

7 Reed Canarygrass Protects Iowa Watershed Structures
By Wallis R. Tonsfeldt

8 Grass Changes the Southeast
By Leon J. Sisk

10 Basal Plantings Healing Road Cuts Nature's Way
By Paul Tabor

12 Grazing Association Has Profitable Land-Use Aim
By T. K. Eaman

14 Fertilizer and Rest Bring Fescue Back
By Sellers G. Archer

16 Better Cattle Not More Cattle Is Conservation Goal
By Hal L. Rogers

17 Brush Control Brings Ranchers More Grass
By Paul F. Larson, John Sampson, and Samuel F. Greenfield, Jr.

20 "Grass Farm" Is Model for Best Use of Kansas Lands
By Fred C. Gleue

21 California Farmer Finds Grass Crops Beat Wheat
By Ed Anderson

22 Ponies—Grass Seed—and Conservation
By Lyman E. Ellsbury

24 Cover Crop Seeding From the Air

COVER PICTURE.—Grass and livestock like these purebred Hereford cattle on Elk Ranch in Teton County, Wyo., add up to big dividends from conservation farming and ranching the country over. —Photo by B. C. McLean

Soil Conservation

ORVILLE L. FREEMAN
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

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FRANK B. HARPER, Editor

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Watershed Land Treatment Boosts Community Income

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By G. Claire Herting and I. B. Stafford

Schoolhouse where first meeting of Great Brook Conservation Co-operative was held. (l. to r.): G. Claire Herting, SCS; Thomas Boyce, who started cooperative; Mortimer Brooks.

CONSERVATION land use centered on improved pasture and hay production is continuing to pay off for dairy farmers and the whole community in the Great Brook watershed of Chenango County in central New York.

Great Brook was No. 1 on the list of 60 "pilot" projects selected in August 1953 for local-State-Federal treatment like that now being carried out extensively over the country through the Watershed Protection and Flood Prevention Act. Although the project formally was completed in 1958, consisting principally of land-treatment conservation measures on the 16,000-acre project's cropland, grassland, and woodland, landowners in the 99 percent privately owned watershed have continued to maintain and expand the conservation work on their lands. Most of the farmers try to improve a few more acres each year.

Their rewards are evident, on the land and in the bank. The conservation treated hillsides and level areas alike were green this past spring, even though the areas were in need of water. In contrast, the few unimproved pasture fields were brown, with no green grass visible. The streams now run clear, because most of the land in the watershed is covered with grass or trees, and the water soaking into the soil in the grassed areas feeds the growing crops and the springs instead of causing erosion and silting.

Officers of the Great Brook Conservation Co-operators, organized to interest everybody in the watershed and the community in the program, estimate that the average yearly increase in total income because of the improved hay and pasture production is more than $3,000 a farm. This increase is possible because the cattle are producing milk at lower cost. This income, in turn, is reflected in improved business for the local feed and fertilizer, seed, farm implement, gas and oil, automobile, hardware and lumber, and other dealers, as well as for the grocery, clothing, drug, and other merchants. The combined benefits to landowners and businesses attest to the watershed development's value as a successful community project.

A sign by the side of the road reads: "Great Brook Watershed"; but what the sign doesn't say is how the people of the valley, through their own efforts in conservation of their soil and water, reversed a trend that had threaten-

Land seeded for improved pasture and farm ponds on Mortimer Brooks (l.) and Orville Alsip (r.) farms in Great Brook watershed.

The authors are work unit conservationist, Norwich, and State conservationist, Syracuse, both of the Soil Conservation Service, N. Y.

ed the communities of South New Berlin and Holmesville. It doesn't tell about floodwater damage to highways and bridges, silting of bottom lands, or sheet and gully erosion on hill land.

Extension of credit was tight in Southern Tier counties, especially for hill farmers who owned most of the farms in the Great Brook watershed. Dairy farming, the leading industry, had been slipping since World War II. The landowners decided in the fall of 1952 that something must be done.

The first of a number of group meetings of watershed farmers was held in October, to find out if the landowners were interested in the benefits the soil conservation program had to offer. Chairman Anson White of the Chenango Soil Conservation District directors explained how the district could furnish technical assistance and help cooperators obtain machinery necessary to establish practices called for in a basic conservation plan for each cooperator's farm. He also told the farmers how a watershed program would help them to raise better crops and produce milk at lower cost, and consequently have more money with which to buy new machinery and other items, repair their farm buildings, pay taxes, and support their churches.

A Soil Conservation Service technician explained soils maps and how the soils affect crops. Dates were set up for SCS technicians to visit each farm and help the farmer go as far as he wanted to go at the time with his conservation plan.

All landowners in the watershed were given an opportunity at such group meetings to learn about the program starting in the Great Brook watershed; and after a few weeks 95 percent of them had become Chenango County district cooperators. Twenty-six groups were represented at a community meeting in Norwich to enlist the cooperation of bankers; feed, fertilizer, and seed dealers; machinery dealers; town and county governments, Federal and State agencies; clubs, and individuals interested in agriculture.

Field days and tours, sponsored by the Unadilla Valley Grange in South New Berlin and by Boy Scout troops and 4-H clubs, both before and after the watershed project was designated on August 14, generated widespread interest in the conservation activities already under way by the spring of 1953. These included pastureland improvement, tree and wildlife shrub plantings, farm pond and wildlife marsh development, and other practices, for which additional Agricultural Conservation Program funds were allotted.

Cyrus Pike's cows thrive on birdsfoot trefoil and timothy pasture on area cleared of brush.

A Brooks pasture before brush was removed.

Through the project, technical assistance was provided by the SCS and the U. S. Forest Service. Little by little, a few acres at a time, the farmers themselves accumulated sufficient funds to improve pasture, the most necessary item in their farming program. As each acre was improved, it brought in more funds to improve more acres. Soon money was available to construct farm ponds, diversion ditches, protected outlets, and other essential farm conservation measures.

Today, you will hear the story of satisfying results from one end of the watershed to the other. As Mortimer Brooks, who has improved more than 75 acres of pasture on his farm, says:

"These improved pastures give me a better milk yield even in the middle of the summer. That's the difference between profit and loss to me. All this has cost me money, but it is paying off now. Under the present conditions in farming, no one can afford not to improve his pastures if he wants to stay in farming."

Others who share Brooks' opinion include: Neighbor Orville Alsip, who won the Master Conservation Farmer Award with Mrs. Alsip in

1962; Kenneth Herman, a director in the organization since it was started and winner of the 1960 Excellent Farmer Conservation Award; President Cyrus Pike of the Great Brook Watershed Conservation Co-operators and 1960 Master Conservation Farmer Award winner; Gerdt Treschow, who has planted more than 100,000 trees on his land; and Past President Walter Whitney who says his stripcropping, ponds, and other conservation measures all pay for themselves and that "I make more money than I used to, so I have more to put back into the farm."

Others include Alf Benson, who credits his pasture improvement and diversion ditches with having helped him to pay his mortgage by producing milk at a lower cost than before the watershed program was started.

Other aspects of the conservation program have not been overlooked. Most farms have one or more ponds to provide water for the cattle. They also are used for swimming, boating, and fishing. Many of the landowners have planted shrubs in odd corners of their land to provide food and protection for the wildlife. Woodland has been fenced to keep cattle out.

These and other measures mark the continuing progress of the conservation land treatment program in the Great Brook watershed.

Utah Rancher Gets Results With Conservation Program

By Donald H. Fulton

EXPERIENCE has borne out the soundness of Utah rancher Bill Karren's decision in 1957 to improve the land he already had at Jensen through reseeding and other conservation measures instead of buying more rangeland.

It was one or the other, because his cows were coming off the summer range in poor condition and with light calves. Karren figures it would have cost at least $10 an acre for land equivalent to his own; whereas it costs him only $10 an acre to reseed, and the reseeded range will run 10 times more livestock on an acreage basis and produce heavier calves. Since he started his conservation program, his calves have increased 75 pounds in weight, and the percent of calf crop for the breeding cows is better than 90 percent.

With the help of a Soil Conservation Service range conservationist, Karren first made an inventory of his range and developed a conservation plan through the Uintah Basin Soil Conservation District, with Agricultural Conservation Program cost-sharing assistance. The plan included dividing the 4,000-acre ranch into four pastures so good grazing management could be achieved. Then in the spring of 1958 he plowed up the big sagebrush and drilled in crested wheatgrass and Ladak alfalfa on an 85-acre area in the north pasture that was in poor condition.

Clippings made on June 14, 1960, showed that the seeded area was now producing 1,400 pounds of crested wheatgrass and alfalfa

Karren compares seeded pasture to his right with native range and its sparse grass stand under big sagebrush.

The author is range conservationist, Soil Conservation Service, Roosevelt, Utah.

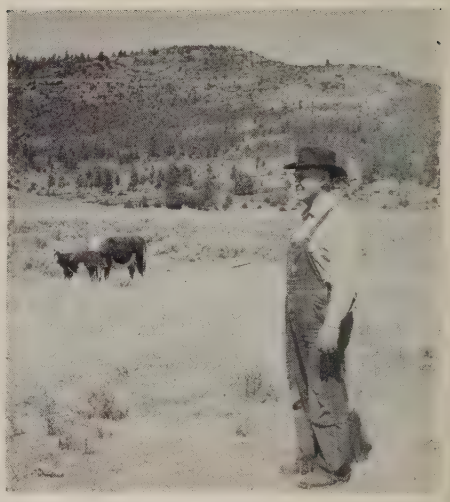
Tank Karren made from old dump truck to hold stockwater piped 1½ miles from mountain spring.

(air-dry weight) to the acre, while adjacent areas in native plant cover were producing only 397 pounds of total air-dry herbage an acre, and 248 pounds of this was big sagebrush unpalatable to cattle. Actually, then, only 70 pounds of this native vegetation an acre could be taken by cattle for proper, or 50 percent, grazing use; whereas on the seeded land 700 pounds of forage an acre were available for proper use of taking half and leaving half. The difference thus was 10 times, or 1,000 percent, more usable forage on the improved acreage than on the undeveloped range.

"When I turned the cows on the crested wheat, I could see them start to put on weight," Karren recalled in explaining his plans to put an electric fence around the 85-acre seeded area and seed the rest of the pasture, an additional 200 acres, to crested wheatgrass.

Range reseeding is only part of Karren's ranch conservation program. Since 1957, he has deferred or rested one of his four pastures from grazing through the plant growing season each year and rotates the grazing in the other three. This system allows the native grasses to seed, and gives young grass seedlings a chance to get established.

He also has made plans for sagebrush control with a spraying program on 3,000 acres, further to increase palatable grasses and the livestock carrying capacity, and provide better erosion control. Meanwhile, with the help of Bob Metcalf, his father-in-law, Karren has installed approximately 3 miles of plastic pipe that carries water from springs on the hillsides to pasture areas that did not have livestock water, constructed four



Karren always has time to show visitors one of his better calves resulting from range conservation program.

earth ponds, and built and repaired 4 miles of fence.

Karren's 200 acres of irrigated land at Jensen also has a new look. He has developed new irrigation systems by leveling his fields and constructing new ditches, so he now has control of his irrigation water. He also installed an 8-inch, ½-mile-long pipeline from the main canal on the hill above his fields to the Green River below. When there is enough water in the canal, he can sprinkler irrigate with gravity pressure, and when water is low in the canal, can pump water from the river through the same system.

"I now go on my mountain range 2 weeks later in the spring and bring them off when the range has been properly grazed," Karren says of his conservation program. "I have plenty of feed on the farm, and this way I can improve my range faster. I am glad I made that decision in 1957. Even though the past 3 years have been extra dry, the grass has still improved and I have sold good calves. I only wish I had started my conservation program earlier."

Karren was selected as outstanding farmer in 1961 by supervisors of the Uintah Basin district, and as outstanding farmer of the year 1962 by the Utah Association of Soil Conservation Districts.

Grass close to a pond is shown in fall before Karren moved cattle off mountain range to graze crop aftermath on irrigated fields.

Reed Canarygrass Protects Iowa Watershed Structures

By Wallis R. Tonsfeldt

A SO-CALLED "haying method" of planting Reed canarygrass has been responsible for many of the stands that today protect a high percentage of the floodwater retarding structures in Iowa's Little Sioux watershed flood prevention project from damaging erosion by wave action.

About half of the 240 structures in the 50 completed subwatersheds in the Little Sioux watershed already have a Reed canarygrass border along the waterline. By controlling wave-action erosion, landowners and Soil Conservation Service technicians helping in the watershed work have found, annual maintenance costs are decreased considerably.

Formerly, stands of Reed canarygrass generally were established by sprigging or seeding; but, because the soil where the grass grows best often is too wet for operating planting equipment, a better way was needed. Finally, a few years ago, Nature showed the conservationists another way to do this job.

It happened on the Garton subwatershed, between Cherokee and Sioux Rapids, where the structural work had just been completed. Wayne Casey, a commissioner of the Buena Vista County Soil Conservation District, had just finished mowing a waterway of Reed canarygrass above one of the impoundments when a heavy rain washed the freshly cut grass into the pond below. Wind and waves then carried the grass ashore, where it took root from the joints and grew into a good, protective border for the pond.

Today, plantings of Reed canarygrass conventionally are made in much the same manner in other places. The grass is cut, between about June 15 and September 15, from an established area and hauled to the pond edge. It then is spread over the area above the waterline with a fork and tramped into the wet ground. It is essential that the cut grass has joints, because the new roots grow from them. The best planting time is when the ground is too wet for fieldwork.

Planting Reed canarygrass by haying method.

Another method used is seeding waterways by hand early in the spring. The seed is placed on top of the ground, where freezing and thawing action work the seed into the soil. This method has been used satisfactorily for the last 4 years or so in the Little Sioux. But the haying method is used primarily for establishing plantings around water impoundment areas, because the wave action is too rough on small plants growing from seed.

Reed canarygrass covers shoreline of pond on Jack Meeves property in Lum Hollow subwatershed near Smithland, Iowa.

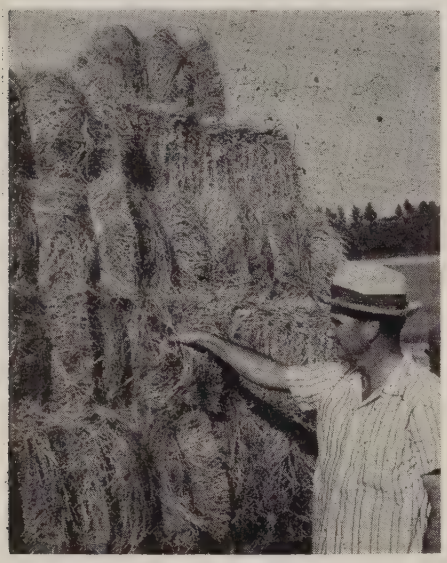
The author is soil conservationist, Soil Conservation Service, Sioux City, Iowa.

GRASS CHANGES THE SOUTHEAST

By Leon J. Sisk

GRASS is changing the face of Dixie.

Ride along the main highways, the farm-to-market roads, or the unpaved roads through sparsely settled sections, and on every side evidence of the change is apparent. Where gullied, wornout cottonfields and wet, "corned to death" bottom lands once met the eye are verdant areas of lush grasses that bind the soil against erosion and help to build it up to produce better livestock and other crops.



Bennett with Coastal bermudagrass he has grown on steep land.

J. F. Strickland of Mershon, Ga., averages 2,300 pounds of tobacco an acre grown after Coastal bermudagrass, compared to only 1,250 pounds before he used rotation.

The answer to what's behind this revolutionary change to grass—after decades of fighting Johnson grass, particularly—can be summed up in one word—profit. In the words of a North Carolina soil conservation district farmer: "Whether you're running beef cattle, operating a dairy, or growing cash crops, grass will make your operation more profitable."

When planted in a grass-based rotation, the experience of farmer after farmer has shown any cultivated crop is better in both quality and quantity. The rotation of grass with the crops in a sense means "resting" or re-invigorating the land, with the land usually in grass for 3 years and then cropped for 1 year, preferably, but not more than 2 years.

The three grasses most widely used in the South are Coastal bermudagrass, Pensacola bahiagrass, and Kentucky 31 fescue. They top the list of grasses used by Soil Conservation Service technicians in helping farmers with conservation farm planning and land treatment. The tall fescue, for example, performs spectacularly in grass-based rotations.

"As long as I'm where there is some fescue, that's where I want to plant my tobacco," one North Carolina farmer says.

Last year, this farmer received $1,698 an acre for tobacco that followed 2-year-old fescue, and only $1,140 an acre for tobacco on the rest of the field.

Fescue was probably the first grass to be used in a sod-based rotation in the Southeast, but now the Bermudas—Coastal and common—and bahiagrass all are being widely used. No accurate estimate can be made of the acreage in grass in the Southeast, but it is generally believed that there are between 4 and 5 million acres in bahiagrass, about the same in the Bermudas, and at least a million acres in fescue.

Bahiagrass has captured the imagination of farmers and soil conservationists in the deep South. In Spanish, Bahia means "bay," but in this region Bahia means a dependable, moneymaking grass that will grow on difficult sites, that can be seeded successfully under severe conditions, and that will persist and maintain itself with a minimum of proper management.

An Alabama farmer applied 400 pounds of 0-14-14 to 12 acres of bahiagrass in the spring and grazed the field until the first of June. He then took the cattle off and topdressed with 150 pounds of liquid nitrogen to the acre, and still was able to harvest more than a ton of seed and 932 bales of hay. A Mississippi Delta farmer says: "Bahia will carry more cattle and still produce more hay than any grass I have ever seen in my 35 years of farming."

Coastal bermuda is another perennial grass that has been widely planted across the face of Dixie to supply grazing during the hot, dry Southern summers when fescue is more or less dormant. Besides providing large amounts of good grazing, Coastal bermuda also makes topnotch feed as hay, silage, or

The author is field information specialist, Soil Conservation Service, Spartanburg, S. C.

green chop. The key to good growth is plenty of fertilizer (2-1-1 ratio), especially nitrogen, and plenty of water.

In a dry season, with the help of irrigation, 15 acres on a Louisiana farm (after a topdressing with 100 pounds of ammonium nitrate) carried 82 head of cattle from June until late fall and still produced 70 bales of hay an acre. It also is a matter of record that 12,000 pounds of Coastal bermuda hay have been cut from a single acre, and even higher yields have been reported. Clemson Agricultural College's Edisto Experiment Station reports beef cattle gains at a little more than 1,000 pounds an acre from Coastal bermuda fertilized with 400 pounds of actual nitrogen.

The use of grass in pastures and in cropping systems is showing up favorably meanwhile in the conservation of soil and water. Three-year-old fescue turned under will add from 10 to 16 tons of residue an acre to the soil. This is also true of the other grasses to a greater or lesser degree. This large amount of material added to the soil makes it mellow and absorptive and lets most of the rainfall soak in instead of running off.

Many Southeastern rivers still run red with the life blood of the soil, but in recent years grass has kept much soil out of the rivers and on the farms where it belongs. Thus the growing of fescue in the hill country comprising the headwaters of the Chattachoochee River watershed has reduced erosion to such an extent that the river no longer runs yellow. More than 65 percent of the landowners have planted fescue and clover in the six counties above Atlanta where the Chattachoochee rises.

Thus the Southeast during the last few years has launched and is supporting movements tending definitely in the direction of a grassland agriculture. It is this new concept of grass as a crop and for improved pasture that is changing the face of Dixie.

Strips of tall fescue sod protect land from erosion and give easy access to tomatoes for spraying, cultivating, and harvesting on Dave Cameron Farms at York, S. C.

This Coastal bermudagrass hay on farm in South Carolina yielded 3 tons an acre.

Bahiagrass being turned for crops in grass-based rotation on Carroll Sease farm in Lexington (S. C.) SCD.

BASAL PLANTINGS

Healing Road Cuts Nature's Way

By Paul Tabor

Strip of weeping lovegrass at base of roadcut slope with Japanese honeysuckle above.

GEORGIA soil conservationists have borrowed a leaf from Nature's book in developing a new method of protecting bare roadcut banks by establishing native plants at the base of the slopes.

As a result, several miles of cuts on the Silver City-Matt highway in Forsyth County now sport dense bands of weeping lovegrass, alone or in mixture with Sericea lespedeza or tall fescue, just above the road ditches. This is the first step in the new basal-planting method. It imitates the natural process of native plants' establishing themselves at the base of slopes.

The idea of basal plantings was developed by the author and A. C. Veatch, Soil Conservation Service agronomist, now retired. The first plantings were made during the summer of 1958 in the Settingdown Creek subwatershed in the Upper Chattahoochee Soil Conservation District. More plantings were made in this vicinity during 1959. In 1960, similar plantings were made in the Blue Ridge district with active cooperation of its supervisors, the State Highway Department, and SCS employees.

Note:—The author is retired plant materials specialist, Soil Conservation Service, Athens, Ga.

Under favorable conditions, Nature prepares an excellent seedbed by the alternate freezing and thawing of the bare road slopes and the movement of the resulting loose soil material downward by rain.

Soil from roadcut slope accumulated behind basal seeding of weeping lovegrass above road ditch.

For accumulation of this eroded material, the road ditch should be a minimum of 15 to 18 inches from the base of the roadcut slope; and the ditch needs enough stabilization to prevent lowering by gullying. Basal accumulation of the eroded material from the cut slope is enhanced by a decrease of gradient downward in the roadcut slope. It is effectively prevented, on the other hand, by an increase of gradient directly into a road ditch that has enough grade for the loosened soil to be carried away by runoff.

In the humid Southeast, longtime leaching by excess rainfall has reduced the fertility of subsoils to a very low level. To insure good plant growth, lime and commercial fertilizer were broadcast on the loose natural seedbed at the base of roadcut slopes, and covered with hand rakes or drag harrows offset from tractors by improvised hitches. Weeping lovegrass and Sericea lespedeza seed was sowed on the basal strip and covered by a second raking or harrowing. The lime, fertilizer, and seed also can be mixed and sowed on the loose, undisturbed seedbed, and then covered with one raking or harrowing. Adequate mechanical equipment for spreading and covering lime and fertilizer and seed on 2-to-1 or greater slopes has not been available.

A dense band of vegetation established on the basal accumulation of

Roadcut slope completely covered after three successive basal-strip sowings of tall fescue, weeping lovegrass, and Sericea lespedeza.

soil materials just above the road ditch will stop the downward movement of silt and promote a second zone of accumulation above. This, in turn, can be planted to widen the vegetated zone. The entire slope can be vegetated by such successive strip sowings.

A second method being tried for covering the bare slope above the first basal planting is to set Japanese honeysuckle plants in prepared holes at 3-foot intervals. As these plants grow, they will spread and cover the slopes. Repeated fertilization apparently will be needed on most sites.

A third possibility is to wait for natural vegetation of the bare slopes above the initial basal band of established plant cover. Such revegetation has not developed, however, in a three-year trial; and mulching may be needed, in addition to the lime and fertilizer, to speed up the process. Also suggested is planting a row of Sericea lespedeza and weeping lovegrass along the top of the roadcut to produce self-sowed seed for the slope below.

Weeping lovegrass strip at base of slope on Matt-Silver City roadcut.

Basal planting of roadcut slopes is an economical step-by-step method of vegetating short- to medium-length slopes that are not excessively erodible. The cost is spread over two or more years. No artificial seedbed preparation is required. This method has been successful on very steep, short slopes, with grade lessened by erosion above and the accumulation of soil materials in the band of vegetation below. The chief objections are the slowness of vegetating the entire roadcut banks, the hand labor needed, the limitations on highly erodible sites and long slopes, and the care required in road-ditch placement and maintenance.

Experience so far indicates that basal plantings on roadcuts have a place on many secondary highways in the Southeast and probably elsewhere.

3-year-old Japanese honeysuckle basal planting on a U. S. Highway 19 backslope.

Campsites

The University of Michigan Survey Research Center found that recreational facilities should be located within 1 or, at most, 2 days' driving distance from the areas which they are intended to serve. For instance, facilities for people in the Northeast must be located in that part of the country. Some campsites should be located in isolated areas for those people who enjoy solitude and forestry. Other camping facilities should be in larger clusters for social interaction, and others should be provided somewhere between the very isolated and the highly clustered type.

E. Hatcher (l.) and Lail Schmidt, local farm leaders who helped organize Association.

Colorado Grazing Associa

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By T. K. Eaman

FORTY east-central Colorado farmers are showing another way for their Great Plains neighbors and others elsewhere in the country to bring about profitable rural area development through locally initiated conservation land use.

They are doing it through the Prowers County Grazing Association they recently formed to enable them to acquire nearly 15,000 acres and develop it through the Great Plains Conservation Program into a profitable grazing area. Approximately 13,500 acres of the new ranch unit is rangeland needing conservation improvement or management, and the rest is marginal wheatland. The Association bought 12,000 acres and took over leases on a total of 2,700 acres of State and private lands.

Financing was made possible through a $375,000 loan from the U. S. Department of Agriculture. The first such loan ever made by the Department, it was made in April this year by the Farmers Home Administration under authority of the 1962 Food and Agriculture Act permitting loans to nonprofit associations for shifting land to grazing, forestry, and recreational uses. The loan will bear 4½ percent interest, with repayments scheduled over 40 years.

The author is range conservationist, Soil Conservation Service, Denver, Colo.

The Association's organizers estimate that the income of its individual members will be increased by nearly $2,500 a year—bringing an additional $100,000 annually into the area's economy. Thus the new conservation land-use improvement and management undertaking not only will enable Association members to balance their farming operations by making fuller and more efficient use of their land and other facilities; local use of funds invested in the development will give an immediate boost to the entire area.

The plan calls for each farmer to own one share in the Association and pay an annual fee to run 40 cattle on the grazing lands, which lie in Prowers and Kiowa counties. A ranch conservation program designed especially for the new farmers' association and reviewed at its request by the Prowers County Soil Conservation District will be carried out through cost-sharing agreements between the Association and the Federal Government under the Great Plains Conservation Program and the Agricultural Conservation Program, with Soil Conservation Service technical help.

Through the Great Plains Conservation Program, 11,350 such cost-sharing contracts as that now held by the Prowers County Grazing Association had been entered into by owners of 26⅓ million acres in 376 counties of the 10 Great Plains States by the beginning of the last quarter of the 1963 fiscal year. They called for more than 798,000 acres of cropland to be converted to other uses, principally to growing grass. That is about one-fourth of all the cropland in the participating farms.

Other conservation measures planned and being applied by farmers and ranchers participating in this program, which started in 1955 and runs until 1971, include range seeding, brush control, deferred and rotation grazing, and stock-

This is the kind of grazing land the Prowers County Grazing Association has set out to develop.

n

Profitable Land-Use Aim

water developments. On croplands, the cost-shared measures include terracing, stripcropping, water spreading, and irrigated land improvements for production of supplemental feed for livestock.

A key part of the new Grazing Association development, similarly, is the installation of a complete conservation plan through the Great Plains Conservation Program, to insure the most effective use of the land, which straddles the Big Sandy River on the Prowers-Kiowa County line. Twenty-four of the Association ranchers already were familiar with such a program, as cooperators with the Prowers and Northern Prowers Soil Conservation districts; but the Association's ranchlands are not in a soil conservation district.

A soil survey of Prowers County has helped with the conservation planning. Soils maps show the kind of soil, land slope, and the nature of erosion. Range sites, land capability, and other information can be obtained from the soil survey. Careful range management is needed on the Association's newly acquired, predominantly sandy lands, in order to keep a good cover of deep-rooted grasses for wind erosion control. The bulk of the land will be developed into top grazing land, which later is counted upon to increase the Association's estimated initial carrying capacity of 1,600 cattle.

This is the system that a member of the grazing association will follow: Calves or short yearling weighing 400 to 500 pounds can be purchased each year and grazed on its ranch from about May 1 to November 1. Credit needed by the farmers to finance their cattle will come mostly from local banks and the Production Credit Association. The Farmers Home Administration, working with local sources of credit, will supplement their lending with additional loans if necessary. Thirty-six farmers started the Association's program off this year when they bought 1,275 cattle and put them on the ranch the first half of June.

Calves like these will gain weight fast when put on good summer range.

The Association's ranch conservation plan shows how the land will be used and how it will be treated for protection from erosion and other hazards. Management guides are set up to provide for the best continued production of grass. Number one among the conservation practices is proper use of the native range grasses.

The ranchers will control grazing to make sure that no more than half of the growth, in weight, of the key grasses will be grazed off each year. Blue grama and western wheatgrass are key grasses on the 2,500-acre loamy plains site. Sand reedgrass, sand bluestem, needle and thread, and side-oats grama are key grasses on the sandy sites. On the 200 acres or so of salt meadow or bottom land along the Big Sandy, alkali sacaton and switchgrass will be the grasses on which management is based.

Seeding native grasses on the 1,440 acres formerly used for dry cropland also is in the Association's conservation plan. Most of this acreage is loamy plains, on which blue grama and western wheatgrass are the two main grasses to be seeded, with bluestems and side-oats grama planted on the sandy sites. Also planned for later on is control of sand sagebrush that covers most of the deep sand site

Association's conservation range operations hinge upon calves like these around windmill on upland range in Prowers County.

and is thick on some of the sandy plains range, competing with desirable grasses for moisture and space.

Association plans are to graze the different kinds of range when the native grasses are most palatable and productive. Deferred grazing will be used. Starting in the spring, the salt meadow will be grazed first. Next, grazing will be on hardlands, especially those having good percentages of early starting western wheatgrass. Finally, grazing will be concentrated on the sandy plains and deep sand range sites, which have the most warm-season grasses and are best used during the summer.

The Association has employed Beryl Cramblett as range manager. He will oversee the essential continuing program of land management, help in keeping records, and supervise good animal husbandry principles.

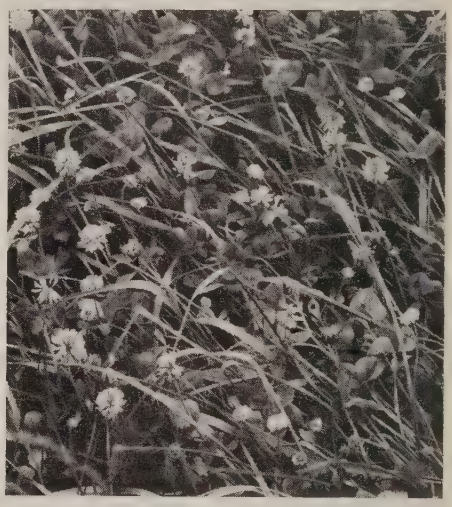
The whole plan, meanwhile, calls for a close working partnership between local people and local, State, and national government agencies —considered by those concerned as one of the most significant aspects bearing upon the future success of this unique locally conceived Prowers County Grazing Association venture.

Fertilizer and Rest Bring Fescue Back

By Sellers G. Archer

A CONSERVATION management formula based on fertilization and a warm-weather rest period has brought Kentucky 31 tall fescue back as a successful and increasingly popular cool-season pasture grass in Alabama and other parts of the South.

The Soil Conservation Service had introduced fescue into the Alabama soil and water conservation program in the mid-1940's by sending 50 pounds—enough for 10 acres—to every county where it seemed to be adapted. It grew off well, made a large quantity of good forage, and remained green practically all year. Some hailed it for year-round pastures and an all-purpose conservation plan.



Fescue and white clover mixture.

Fall-planted Ky. 31 tall fescue already protects this Marshall County, Ala., waterway by the next spring and is fenced for grazing.

But a decade later it was losing its popularity in southern Alabama. Farmers complained that cattle did not make good gains on fescue during the hot months and that their pastures did not recover well in the fall.

The late Hal C. Graves, work unit conservationist at Atmore, Ala., was one of the many Soil Conservation Service technicians who had built a conservation program around fescue. Now Graves' fescue-based program was theaten-

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ed, but he did not give up easily.

First, in consultation with T. C. Mauer, SCS Washington-field agronomist for the Southeastern States, and State technicians, he tried heavy fertilization. Two tons of limestone and up to 1,000 pounds of fertilizer at planting time produced excellent fall and winter pasture, but didn't carry the grass through the summer grazing season and into the next fall.

Graves and the farmers he worked with turned to everyday horse sense to find another key for fescue success: Nature provides a rest period for every plant, they reasoned, and even though fescue stays green in the summer it is essentially a cool-season grass. They decided that they had expected too much from the new grass.

E. V. Wright, who succeeded Graves, gives this formula as a typical example of that which Graves and the farmers developed by trial and error, to put fescue back in the picture and set a pattern for good pasture management: Grass and Ladino clover are planted in October with 2 tons of lime and 1,000 pounds of 4-12-12 fertilizer. An additional 600 pounds of this fertilizer is applied each fall. Pastures are topdressed with 600 pounds of ammonium nitrate, divided into three applications in the fall and winter.

Grazing begins on established pastures in mid-October. Cattle are removed by April 15, leaving at least 6 inches of growth to accumulate food reserves in the roots to protect them from hot weather sun. Fescue gets the same management when it is used in meadow strips for a waterway, for field stripcropping, for field borders, or in a sod-based rotation. In all cases it may be an important source of pasture or hay.

The formula may vary, but the basic principles worked out in southern Alabama apply wherever fescue is grown, Maurer says. For example, in northern Arkansas where the winters are less mild, the grass is grazed in spring and fall, but not in the coldest months.

Shorthorn cattle in good fescue pasture in Mitchell County, N. C.

Agronomist A. E. Spooner of that State's Batesville Experiment Station reported finding the best grazing seasons to be mid-September to early December and from mid-March to mid-July, with rest periods in both the summer and winter. He reported 2⅓ animal units of grazing an acre for the period, a gain of about 1 pound a day per animal, and 417 pounds of gain an acre for the two seasons.

Meanwhile, farmers' experiences in the Atmore area show the success of the new fescue management formula in Alabama: W. D. Cruit wintered from 75 to 100 cows on 13 acres of fescue and gleanings from 18 acres of corn stover. R. L. Goldsmith carried two to three cows an acre on 200 acres of fescue from October 1 to April 1—and then put up more than a ton of high-quality hay to the acre.

J. Rob Williams reported that beef cattle on fescue pasture and cottonseed meal gained 100 pounds more than animals fed the same amount of meal and good hay. Fifteen acres of fescue carried 65 cows from October 1 to April 1 for Mack Carpenter. Six acres carried 20 cows for 60 days for C. M. Byrd. Mack Reed wintered 80 400-pound steers on 40 acres of fescue for 5½ months.

Have You Seen?---

● "Multiple-Purpose Watershed Projects, Under Public Law 566," by the Watershed Planning Division, Soil Conservation Service, USDA's PA-575, superseding PA-392, "Small Watershed Projects Under the Watershed Protection and Flood Prevention Act." These projects can include many purposes: Flood prevention; agricultural water management; municipal and industrial water supply, both for present and future use; and recreation and fish and wildlife developments. The pamphlet tells how to make application; develop a watershed work plan; finance, carry out, and maintain the project; and lists other available help in addition to that under Public Law 566.

● "Soil and Water Conservation in Many Countries," by Phoebe Harrison of the Soil Conservation Service, USDA Miscellaneous Publication 908. This picture booklet tells about soil and water conservation around the world.

Better Cattle Not More Cattle Is Conservation Ranchers' Goal

By Hal L. Rogers

Sprinkler system in operation. Ridges and benches in background were used in past for hay production.

QUALITY instead of numbers is the key to the Large Cattle Company's operations in central Idaho where Ben Large says "we stand the acres on edge and graze both sides."

The company, with ranch headquarters about 20 miles down the river north of Riggins, has one of the outstanding ranching operations in the Salmon River Soil Conservation District.

Conservation range management and herd improvement make it possible for Ben and his partners —brother Jim and Jim's son, Sam —to live up to their standard of better cattle instead of more cattle on their spread along U. S. Highway 95 between New Meadows and Whitebird. Although the rangeland is rough and steep, Ben will tell you "we have the best cattle country in the West here." But winter feed has been a problem for ranchers on this stretch of the Salmon River. That is why he emphasizes "we must concentrate on quality instead of numbers."

Between 9,300-foot peaks and the river, itself at 1,500 feet elevation, there are a few sloping benchlands which drop off almost vertically to the river. These benches, along with occasional large alluvial fans and gravel bars, provide the only land available to grow winter feed; and early placer mining left much of the best benchland marred by huge gullies. In fact, young Sam's grandfather, Sam Large, established ownership on an original 160 acres through a mining claim and, Ben says, wasn't interested in ranching.

His rancher sons and nephew long have recognized the need for a method of obtaining more efficient and rapid gains on their calves, and the company set out to develop a system by which they could sell more beef per cow. They have used the natural resources,

Ben Large adjusts sprinkler head on irrigated pasture from which 4 cuttings are not uncommon.

The author was formerly soil conservationist, Soil Conservation Service, Grangeville, Idaho.

conservation practices, and intensive management to get maximum production. Quality and rate of gain were improved by careful selection and breeding practices; and artificial insemination improved the quality of the cattle.

Irrigation increased the production and quality of winter feed. Land once used for hay now provides more and better spring and fall grazing, increasing the total animal units a month for the ranching unit. Commenting on the practice of some stockmen who leave cattle on range long after key forage species have been grazed down to safe levels, Ben says: "Hard on the range and doesn't do cattle any good."

Soil Conservation Service Engineer Donald Stewart designed a sprinkler system which was put into operation in 1961 on 75 acres. The ranch now produces as much hay on 75 acres as on 220 acres formerly. Instead of 1½ tons of dryland alfalfa hay, fields now produce 6 tons to the acre.

"We used to farm up to 150 acres of hayland, but we sometimes didn't get over a half a ton an acre," Ben Large said.

Cost of installing the sprinkler system, with water pumped from the river, will be offset by increased feed production in only a few years. Not only does it cost less to harvest hay from the reduced acreage, but the dryland that once was used for hay will be seeded to improved pasture species to provide for additional cows and offer more opportunities for rotation-deferred grazing on spring-fall ranges.

The Larges have leased an adjoining 1,700-acre ranch, which will be operated in connection with their own spread. With the 80 acres of irrigated hayland and more than 100 acres of dryland alfalfa-grass pasture on the second ranch, their winter feed problems will be further reduced.

Brush Control Brings Ranchers More Grass for Livestock

By Paul F. Larson, John Sampson, and Samuel F. Greenfield, Jr.

RANCHERS of the Southwest and Inter-Mountain areas in particular long have been bothered by grass-choking and water-robing brush spreading over more and more of their rangelands in the wake of heavy livestock grazing and prolonged droughts. A growing number of ranchmen now are doing something about it.

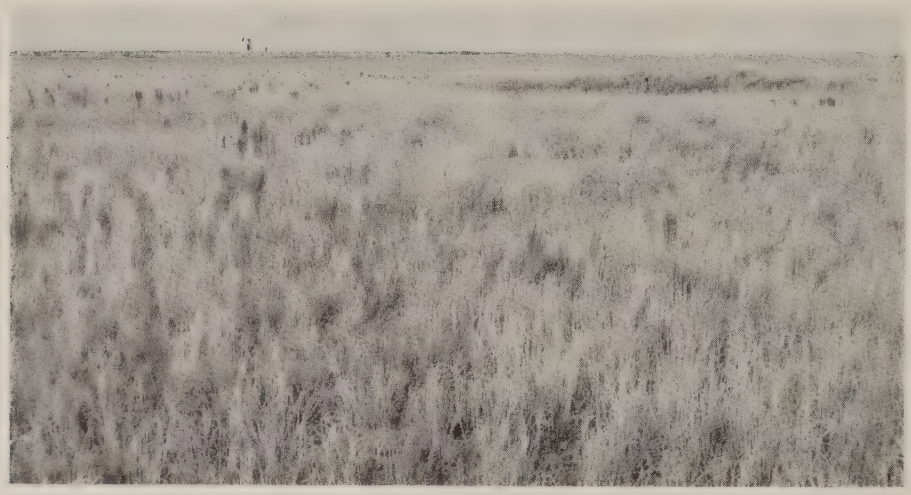
They are turning to brush control as an effective and profitable range conservation measure for the benefit of livestock and game. That is, when it is coupled with such other practices as stocking within the grassland's safe carrying capacity, deferred and rotation grazing, and more even distribution of livestock on the range through planned water and salt placement. Also, continued brush control measures may be made necessary by recurring infestation of some kinds of brush under certain climatic or other conditions.

Blue gramagrass and muhly grass begin to form protective cover on sand.

The dry rangeland brush problem exists from the Southern Great Plains to the Pacific Northwest. The National Inventory of Soil and Water Conservation Needs, made at the turn of the 1960's by the U. S. Department of Agriculture in cooperation with State and local governmental and private interests, showed the Southern Plains States of Texas and Oklahoma to have more than 28.6 million acres of this unwanted vegetation on rangelands—28.5 acres of it in Texas alone. The Mountain States were runner-up with 20.3 million acres of brush, followed by the Pacific area with about 2.3 million acres.

Representatives of the Soil Conservation Service, which had the leadership among Department agencies that helped make this first such comprehensive land and water resource study ever made, point out that many more millions of acres of brush infestation are to be found on lands classified in the inventory as woodlands but still primarily suited to grazing use.

The authors are work unit conservationist, Littlefield, Tex.; soil scientist, Brighton, Colo.; and range conservationist, Bend, Oreg.; all of the Soil Conservation Service.



This is how Montgomery pastures have changed from poor to good condition after shinnery brush control and solid grass seeding.

They estimate the uninventoried brush-infested acreage to be possibly even greater in some such woodland areas than in those classified as rangeland.

The so-called "brush" includes a variety of woody plants, distributed according to climate, soil, and other conditions. They range from shin oak, an outcast runt of the stately oak family, to the more rugged mesquite and junipers, and include in widest distribution of all sagebrush of many varieties. Allowed to spread uncontrolled, they not only shade and crowd out palatable forage plants but also rob the soil of moisture needed by the grass.

Various brush control methods have been used successfully, depending upon such factors as the kind of brush, severity of infestation, acreage to be controlled, and the landowner's or operator's facilities for carrying on a control operation. The control methods include everything from burning and reseeding to uprooting the brush with plows or other suitable equipment, and from tearing out the brush with heavy, power-drawn chains dragged over the land to spraying with special herbicides that are nontoxic to domestic animals, wild game, or birds.

Spraying, usually by airplane, often is favored by the landowners, because of the large areas that can be treated rapidly by this method. Soil Conservation Service soils and range management technicians working with western soil conservation district ranchers and farmers are called upon to supply basic information on brush control needs and sound information as to the best way of going about the job. They emphasize that, whatever control measures are used, the objective is "control"—not "eradication"—to provide more forage for livestock and wild game.

Through such conservation control methods, enough brush plants are left to give cover to game birds and animals; and the better grass stands resulting from control offer more food and cover to deer and other animals than the brush did. In its brushy condition, SCS biologists point out, much of the land provides little for game to eat, and an important goal of brush control is to subdue enough of the undesirable vegetation to improve wildlife habitat. The objective, they explain, is a "rational" brush control program—not a "scorched earth" policy.

Rangeland brush control is one of the conservation practices for which landowners may obtain Federal cost-sharing help through the Great Plains Conservation Program. Requests for increasing the amount of such money that may be earmarked for brush control are growing as the practice spreads. The experience of brothers John H. and Jim Montgomery in the Duck Creek Soil Conservation District in the rolling plains of West Texas in now growing grass where shin oak used to thrive is one of many that point up the reason for brush control popularity.

One of the Montgomery units consisted of two sections of sandyland range in poor condition where the skin oak had gained control.

Bradbury (r.) plans sagebrush control with SCS Conservationist E. Louck (l.) and range specialist Ray Thompson.

They aerial sprayed the unit in June of 1959 to control the shin oak. The next winter, the Montgomery brothers overseeded the two sections with a native grass mixture of sand lovegrass, switchgrass, Indian grass, and side-oats grama, using their own equipment to save on costs. The two sections also were cross-fenced, and an adequate storage facility for water was built.

The brothers deferred grazing after brush control from spring until frost; and adjusted grazing during the winter months so that not more than one-half of the year's growth was removed. They have more than doubled the cattle carrying capacity of their pastureland.

Juniper trees pushed into piles with uncleared area in background on McDonald ranch near Ashwood, Oreg.

Up in northeastern Colorado, rancher Tom Bradbury of Byers and Roggen is controlling brush to improve 820 acres of land he added to his ranch in 1962 to make more room for his cow herd. He started in June 1962 by spraying 450 acres of mostly sand sagebrush, weeds, and cactus with a 2-4-D low volatile ester in a diesel oil-water mixture from an airplane. A second treatment was made at the start of this year's growing season to take care of expected new growth at the base of the now dead sage bushes. Meanwhile, in spite of a dry year, grass seed heads were showing up all over the treated area.

Bradbury, who got SCS advice through the Southeast Weld Soil Conservation District, estimates he saved 60 percent on clearing costs; which average $3 an acre in the county, by drawing upon Great Plains Conservation Program cost-sharing. An SCS soil and land capability map of the ranch showed Bradbury the kinds of soils—loose and sandy and susceptible to wind erosion—on the place and their ability to produce feed and resist erosion. A range condition map showed the kinds of grasses and plants, what condition they were in, and the problem areas with more than 10 percent sage and only 5 percent of the most desirable grasses—needle and thread, prairie sand reed, and sand bluestem.

There is enough of the desirable grass, but Bradbury will keep his cattle off the sprayed area until the grasses have developed a thick stand.

Ranchers in the Trout Creek Soil Conservation District in Jefferson County, Oreg., are in the midst of clearing 200,000 acres of juniper, which since 1900 has moved from the rocky south slopes, ridges, and dry canyons and invaded once good bunchgrass range. They have cleared approximately 4,000 acres with bulldozer and power saw since 1958. Use of chemicals has not proved satisfactory in this area.

There is an estimated 1½ million acres of the juniper forest type in Oregon. Ring counts show that most juniper stands in Jefferson County, at least, are less than 70 years old. SCS technicians estimate a heavy stand will shade out 30 to 50 percent of the ground surface at noon, and also rob grass of moisture and plant food. Recent range surveys showed native bunch-grasses formerly produced 1,000 to 1,300 pounds of dry forage to the acre on Tub soils range in good condition, compared to less than 200 pounds today on juniper infested lands; and ranchers find they can get yields of 1,500 to 2,500 pounds of feed an acre by seeding to improved grasses.

Trout Creek ranchers are drawing upon Agricultural Conservation Program cost-share funds for the approximately $20 an acre cost for clearing juniper—a cost they expect to see paid back with good interest. Clearing contractor Tom McDonald, for example, reports getting a week's feed for his sheep on cleared range where he formerly got but 2 days' feed; and cheatgrass now grows 10 to 14 inches high instead of the 4 to 6 inches on uncleared land.

The juniper is cleared in summer and fall, piled and later burned; and grass is seeded in the freshly disturbed soil before the next growing season. The Trout Creek district bought a heavy-duty rangeland drill designed by the U. S. Forest Service to seed such unprepared seedbeds. Among others who are fighting the juniper, which prefers the best soils and rangeland with a high forage potential, are Aaron Hale, who has lived on his Trout Creek ranch for 78 years; Willis Nartz, Charles Keegan, Brick Bannon, and Tom McDonald. They figure they have no other choice.

"Grass Farm" Is Model For Best Use of Kansas Lands

By Fred C. Gleue

THE sign says: "Grass Farm —Take Half-mile Side Trip at Your Own Risk—Travel by Horse, Car, Camel."

A lot of visitors are taking the invitation at its word. They are taking a look at the 17-acre grass plot—mainly by auto, of course.

The "farm" is the work of the Republic County (Kans.) Soil Conservation District. The Soil Conservation Service staff at Belleville lent a hand.

The farm, between a trading post which sells souvenirs and a city-maintained display of buffalo and other wild animals, is a tourist attraction in its own right. A leaflet explains to visitors the uses and characteristics of the various grass species. The slopes range from 5 to 20 percent. The area had been cultivated for 50 years.

Eight varieties of grass are growing on the acreage, formerly a sloping patch severely notched by gullies. All of the grasses—some in rows and on the contour—are flourishing. They are a silent message from the district: land like this has a safe and profitable use with conservation treatment.

There are 40,000 acres of that kind of land in the district, suited to grass rather than to the usual corn and milo. It could be highly productive, the district board wants people to know, if in properly planted and managed grass.

The board of supervisors of the Republic County district put in the farm in 1957. It leased the land for 10 years from the city of Scandia, for a nominal annual fee.

The grass varieties are big bluestem, little bluestem, Indian grass, switchgrass, side-oats grama, Caucasian bluestem, sand lovegrass, and western wheatgrass. The district supervisors agreed on the grass farm idea to show farmers and others what can be done with grass on this type of Class IV land—that native grasses can be established successfully with known methods. They wanted viewers to see the different grasses side by side. They also wanted to show how grass seed can be harvested for added income or to plant more grass acreage.

SCD Supervisor Glenwood Freed (r.) and author by grass farm sign at Scandia, Kans.

When the farm was established, Glenwood Freed was board chairman. His interest and effort contributed a lot to the venture's success. The board members all pitched in to mow, cultivate, spray, harvest, and market. They got 100 pounds of switchgrass seed an acre the first year. They harvested 300 pounds of Indian grass.

Once each year, the district supervisors gather at the farm to evaluate their efforts and to talk over new plans. Soil Conservation Service men keep a close check on the plantings. In their daily work, they also often suggest to landowners and operators that they have a look at the place.

The board members admit that

Field of Blackwell switchgrass being examined for seed development.

Note:—The author is work unit conservationist, Soil Conservation Service, Belleville, Kans.

you can't easily put a value on the results of the grass work. They do know, though, that there is much of that kind of land in Kansas and in other States of the Great Plains. Grass like that, with conservation use, would mean permanent production and profitable income from such acreages.

Kansas has 18 million acres of grassland within its borders. It is a vastly important asset to the people of the State. The Republic County district board thinks its display of strong, high-producing native grasses can help to get a lot of Sunflower State farmers and ranchers to appreciate their value.

California Farmer Finds Grass Crops Beat Wheat

By Ed Anderson

DIRECTOR Victor Stuart of the Montague Water Conservation District and the Shasta Valley Soil Conservation District is helping to write a new chapter of grass-and-livestock farming in the up-and-down story of northern California's Shasta Valley agriculture.

Conservation practices have figured in conversion of Stuart's former wheat ranch to a largely hay, pasture, and cattle operation. Wheat now plays a minor role in his crop rotation system. The change has nearly tripled gross income on one part of the 500-acre ranch.

Son of a row crop farmer in Ventura County in the southern part of the State, Stuart got his first glimpse of Siskiyou County about 1927 while following the crops as a harvest hand from California to Washington.

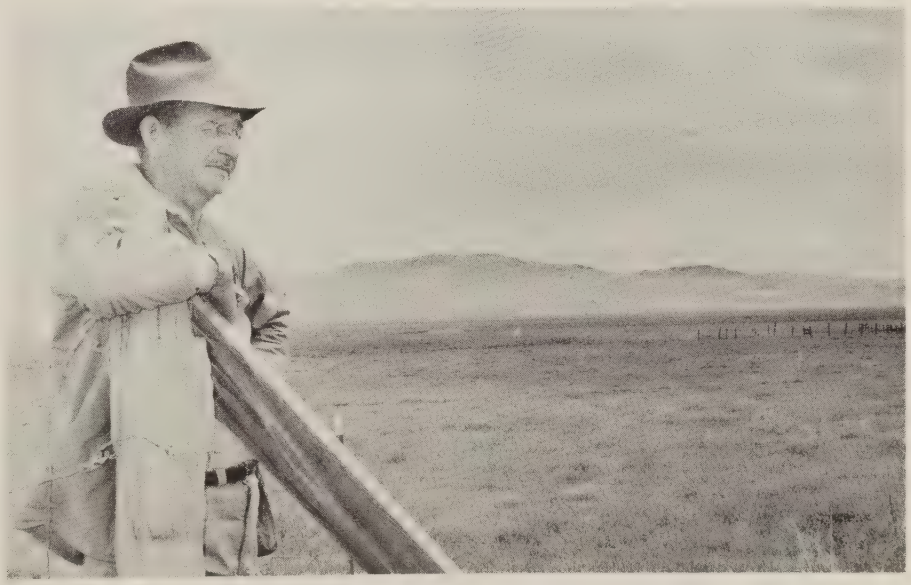
"The first time I saw this area I didn't think much of it," Stuart now admits—but 20 years later he not only had changed his mind but was farming there.

That was after he had visited Siskiyou County again, on a hunting trip following a World War II hitch with the armed forces, and saw an opportunity to enjoy more elbow room than in crowded Riverside County where he earlier had settled as a house painter. He moved his wife and small daughter north in 1947. The land they bought in the Montague area didn't even have a house or well on it. Theirs was a 20th century version of pioneering, in an area steeped in the tradition of post-gold rush days.

Barley, oats, wheat, hay, and livestock have figured in the area's economy since the first farmers broke ground in the 1850's. Stuart's farm lies in a 12- to 14-inch rainfall area. It includes some irrigated Class III and IV land. Dryland is Class IV.

Stuart discovered, as many another grain farmer, that it takes a lot of land to support the farm machinery needed today—more land than he could put into production. He converted some of his land from grain to alfalfa the first year, and has continued the conversion ever since. He now has 129 acres of irrigated pasture.

When local farmers and ranchers voted in the Shasta Valley Soil



Stuart looks over part of the acreage he has converted from wheat to hay and pasture for beef on his 500-acre ranch.

The author is work unit conservationist, Soil Conservation Service, Yreka, Calif.

Irrigation water storage pond on Stuart's ranch doubles as wildlife habitat.

Conservation District in 1953, Stuart was named one of its directors and has continued on the board since. With the help of Soil Conservation Service technicians working with the district, he developed a basic conservation farm plan.

In 1955, he leveled 40 acres and planted them to irrigated pasture. Because the irrigation water delivered on a 21-day cycle was too long a period for irrigated pasture, Stuart built a farm pond to hold some of the "ditch water," and thus was able to irrigate on a shorter cycle.

The 48-acre-foot reservoir also has attracted waterfowl, some birds even nesting there. Wildlife habitat was further enhanced by planting a multiflora rose hedgerow near the reservoir. A number of sportsmen lease hunting rights from Stuart each year for ducks and pheasants.

Stuart, meanwhile, has converted some of his land to irrigate alfalfa and Greenar wheatgrass. The alfalfa and grass are cut for hay, and then the alfalfa is left for a seed crop. Through the Conservation Reserve Program, he diverted 185 acres of Class IV land from wheat to Greenar wheatgrass and alfalfa in alternate rows. He plans to keep this land in permanent cover. He also plans to convert another 135 acres of native grassland to the alfalfa and grass combination in alternate rows. He plants only 52 acres of wheat as a rotation crop with his pastures.

Some of Stuart's Class IV land was underlain with hardpan at 10 to 20 inches. By subsoiling about 107 acres to a depth of 30 inches, at a cost of $18 an acre, he increased his yield of alfalfa and grass to 2½ tons of hay an acre on the first cutting. Another 20 acres was too wet part of the year because of poor drainage. A new ditch installed by Stuart not only drained the area but also provided supplemental irrigation water.

For the present, Stuart is content to "board" cattle, receiving so much a head for running them through the growth period on his lush irrigated pasture. The pasture contains alta fescue, Alsike clover, and birdsfoot trefoil. Last year he took in 100 cows with 400-pound calves, but figures he could handle up to 250 cattle all together.

Stuart tells how all this change has paid off:

"My first cutting of alfalfa yielded 2½ tons an acre; the alfalfa seed I grew on top of that went 300 pounds an acre. I grossed $135 an acre. Then, I can graze it for pasture and get more income from that. Wheat used to bring in about $50 an acre."

Ponies—Grass Seed—*And Conservation*

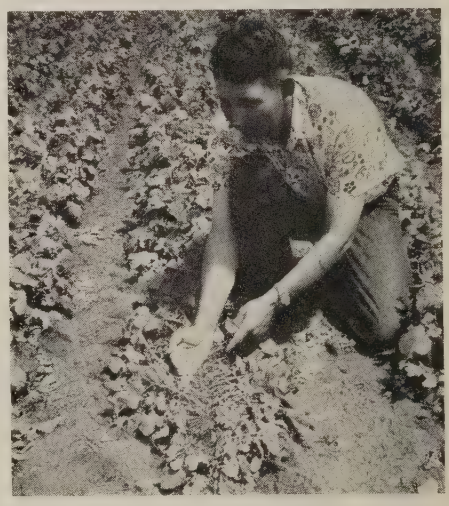
By Lyman E. Ellsbury

THE Paul Etheridge farm 6 miles west of Ralston, Wyo., has two claims to distinction: It is home for one of the largest herds of Shetland ponies in the West, and all of its cultivated acreage is used to grow certified grass seed.

The Etheridge Shetlands are famous and now number 170 head, including 65 brood mares and 5 stallions. Two registered stallions, "Nugget" and "Wildfire," have taken champion and grand champion awards at fairs and horse shows in Wyoming and Montana.

Etheridge, a veteran of World War II, and his wife, Eileen, homesteaded their unit on the Heart Mountain Reclamation Project in 1950. In 1952, he became a cooperator with the Cody Soil and Water Conservation District, and by 1956 developed a complete conservation plan that included drastic changes in land use in addition to the usual conservation practices.

Etheridge had become dissatisfied with the heavy cost of raising beans, seed peas, and alfalfa. Wind erosion was also a problem on his harvested fields. The Soil Conservation Service suggested he try



Etheridge parts radish leaves to show new grass seedings showing in this nurse crop.

The author is work unit conservationist, Soil Conservation Service, Cody, Wyo.

Etheridge shows off "Wildfire," one of the at least 5 pony stallions he keeps.

grass seed production as a cash crop and a deterrant to wind erosion.

In 1956, Etheridge planted 19 acres of Amur intermediate wheatgrass. When it started producing seed, the Great Plains Conservation Program was increasing the demand for grass seed, and Etheridge had a good market. In addition, he found that the few head of Shetland ponies which he then owned did well on the grass fields after the seed was harvested.

"I've always been fond of Shetlands," Etheridge says. "I decided this would be a good combination—ponies and grass seed."

During the next few years, he seeded more land to grass and acquired more ponies. As the conversion from cropland progressed, Etheridge worked closely with the Cody district to improve his irrigation system. The Park County Agricultural Stabilization and Conservation Committee shared the cost of installing needed concrete ditch lining and water control structures.

In 5 years, Etheridge converted 297 of his 317 irrigated acres from cropland to grass seed, pasture, and hayland. Only 20 acres are presently being used for other crop production. Certified grass seed is being produced on 126 acres.

Most of Etheridge's grass is seeded with radishes as a companion crop. The radish seed mixed with grass seed in the drill box facilitates the even flow of seed through the drill. The quick emergence of radishes after seeding soon makes the rows visible for early cultivation and irrigation. Radish seed is harvested late in the fall and provides a good cash crop from the field the first year.

Species of grass seed produced on the Etheridge farm include Amur intermediate wheatgrass, Whitmar wheatgrass, Sodar streambank wheatgrass, slender wheatgrass, and green needlegrass.

Yields average about 250 to 300 pounds an acre of Sodar wheatgrass seed and about 450 pounds of Amur wheatgrass. His slender wheatgrass, which reaches full production in its second year, has yielded as high as 700 pounds of clean seed to the acre. Etheridge also has planted green needlegrass seed obtained from the Soil Conservation Service Plant Materials Center at Bridger, Mont.

"One of the essentials for good seed yields," he says, "is the use of commercial fertilizer. I apply 40 pounds of available nitrogen an acre the year I seed the grass; the second year, I apply 90 pounds of nitrogen and then 180 pounds of nitrogen each year."

Three irrigations are needed to produce a seed crop. The fields are irrigated again after seed harvest to stimulate growth for fall pasture. The straw is baled for hay.

Etheridge explains why he is completely satisfied with his present operation: "Why shouldn't I be? I use less equipment, less labor, less water, have less risks; and, best of all, I am making more money than I ever did with the old cropping system."

This seed production field of Amur intermediate wheatgrass was the first Etheridge planted, in 1956.

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Cover Crop Seeding From the Air

Farmers cooperating with Ohio's Divide Soil and Water Conservation District have set new records in cover cropping in the Crawford County area by aerial seeding of Italian ryegrass. Chairman Clifford Hoover of the district board says the use of cover crops is now a key conservation practice as farmers strive to improve soil tilth and control soil erosion.

Left: Contractor-pilot Don McGinnis of Bowling Green uses a specially equipped airplane to seed 168 acres of corn to ryegrass within 3 hours on James E. Huggins' "Blue Goose" farm in Dallas township. Carrying 400 pounds of seed, he applied about 20 pounds to the acre. At the same time, Farm Operator Robert Dunn with a tractor equipped with a conventional cyclone-type seeder seeded 50 acres of corn at the last cultivation. Promising stands resulted from both methods. Huggins resorted to the aerial seeding when his corn grew too fast in 1962 to permit use of conventional seeding methods at the last cultivation.

Right: Edward Burger of Tiro checks an excellent rye grain seeding made the fall before by plane in his 50-acre cornfield. Burger had acted as flagman, while W. W. Snyder of Fostoria seeded a strip 10 corn rows wide at each flight across the field. Snyder seeded 25 acres an hour, applying 1½ bushels an acre.

Photo picture story by Robert H. Mills, work unit conservationist, Soil Conservation Service, Mansfield, Ohio.

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Fruit and Nuts

The acreage of land in fruit orchards, groves, vineyards, and planted nut trees is heavily concentrated in two States—California and Florida, which together accounted for more than half the total acreage used for these crops in 1959. California alone had a third of all acreage in fruits and nuts. In California a wide variety of fruits and nuts are grown including citrus fruits, deciduous fruits, grapes, walnuts, and almonds. Florida is principally important for its citrus production. Michigan is the third ranking State in acreage in orchardland, and is particularly known for its cherries, apples, and peaches. It is closely followed by Georgia with its peaches and pecans, Texas with its citrus and some pecans, and New York with its vineyards and its several other deciduous fruits. Washington and Oregon are important producers of apples and some of the other deciduous fruits such as pears. Pennsylvania has a less concentrated but significant fruit production, particularly apples.

—From 1959 U.S. Census of Agriculture special report on land utilitzation (Vol. V, Part 6, Chapter 1, p. 43) by U.S. Bureau of the Census in cooperation with USDA Economic Research Service.

We should so live and labor in our time that what came to us as seed may go to the next generation as blossom, and what came to us as blossom may go to them as fruit.

—H. W. Beecher

COVER PICTURE.—Beauty and conservation distinguish Green Tree Orchard with its Ladino clover cover crop around the trees in California's Placer County Soil Conservation District.—Photo by Robert B. Branstead.

VOL. XXIX, NO. 2 SEPTEMBER 1963

CONTENTS

Page

27 Conservation Helping Family To $500,000 Orchard Income
By Paul W. Ice

28 Wind Erosion Control In Vineyards Helps California Area
By John O. Dean

30 Sod—Cover Crops—Contouring Solve Orchard Problems
By W. D. Miller

32 Contour Planting—Water Use Serve Florida Citrus Growers
By Howard E. Van Arsdall

34 Native Pecans Paying Crop For Kansas Farmers
By F. DeWitt Abbott and Luther J. Gaskell

36 Grape Growers—Areas Gain From Conservation
By John D. Kiehle and W. A Mason, Jr.

38 Fruits of Conservation
By Clyde T. Lowe

39 Conservation Berry Farming for Family's Success
By Fred B. Alcorn

41 Timing Peach Orchard Cover Crops
By C. S. Britt and R. R. Robinson

42 Conservation Helps Puerto Rico's Coffee Production
By J. F. Marrero

44 Soil Management Helps West Viriginia Apple Grower
By James H. Conklyn

45 Cover Crops Prevent Erosion—Produce Tastier Fruit
By John Dixon

46 Terraces Stop "Wet Feet" In Ohioans Peach Orchard
By Earl P. Carlton

47 New Orchard for Old Pays Off for Oregonian
By Robert R. Lonzway

48 Wenatchee Orchards Take To Cover
By David E. Roach

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FRANK B. HARPER, Editor

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Conservation Is Helping Family To $500,000 Orchard Income Goal

By Paul W. Ice

CONSERVATION and other modern methods have helped Ray and Claudean Grammer to build up a potential half-million-dollar apple and peach growing business from their start on a wornout 60-acre southern Illinois fruit farm in 1946.

The Grammer's 400-acre apple and peach growing operation in the hill country southeast of Murphysboro also is one of those that plays a big role in bolstering the local economy in this area. Grammer and his wife, cooperators of the Jackson County Soil and Water Conservation District since 1959, keep 8 to 10 employees the year around and hire 75 to 100 during harvest.

"We had a rough time the first 2 years," Grammer says, "but we're doing a more than $100,000 business, now. Within a few years, when our younger trees begin to bear, we expect to gross $500,000 a year."

Step inside Grammer's large packing shed today, and you will see an array of ultra-modern processing machinery. He plans to add a large cold storage plant in 1964. Across the road from the packing shed is the Grammers' modern ranch-type home—"our retreat after a 12- to 14-hour day." In compliance with migrant-labor laws, they also have built adequate modern housing to accommodate 76 employees.

They don't believe in going into debt; the business must pay its own way.

"We try to grow as our farm grows," Grammer explains. "We always take a good inventory of our crops before spending much money for improvements."

Grammer grew up on the same farm he now owns, picked apples there as a boy, and dreamed of some day owning his own orchard. When he and his wife started out, their equipment consisted of one team of horses, a mower, a wagon, and an old two-cycle spray rig. They bought 210 acres of the present 500-acre farm out of their savings in 1946, salvaging enough good trees from the 60 acres to get a start. The other 290 acres was added in 1956.

Much of Grammer's land in 1959 still was in cutover timber, which he wanted to clear and plant to fruit trees, but lack of water threatened to limit expansion. The Soil Conservation Service, through the Jackson County district, provided a soil capability map of the Grammer farm, showing the land that could be cleared safely and economically for new orchards. Grammer has cleared and planted all of this brushland but 15 acres, which will be cleared this fall.

SCS engineers investigated pond sites to provide additional water for orchard spraying and for irrigation during the critical dry periods; because the four existing small spray-ponds were shallow and full of water-weeds and moss. A large pond was built in 1960.

A diversion terrace brings in water to help fill the pond, which is stocked with bass and bluegill. Grammer can fill his spray-tanks by gravity flow at the rate of 100 gallons a minute. He estimates this saves more than $500 a year in time, labor, and money; because he formerly had to maintain electric pumps and screen and filter the water from each of the small spray-ponds.

Grammer thinks cover like this dense 1963 crop of annual field brome he's discussing with author may be answer in his area's peach orchards.

Grammer uses a rotary tiller to clean cultivate under trees to control weeds, mice, and insects and to conserve moisture.

The author is work unit conservationist, Soil Conservation Service, Murphysboro, Ill.

Five-year-old apple orchard being sprayed in 1963 by one of 5 machines used by Grammer. Cover crop is disked lightly each year and fertilized.

Grammer grows permanent cover crops in all of his orchards to control erosion and to improve soil tilth and water-holding capacity. He uses orchardgrass, fescue, and Ladino mixtures but likes orchardgrass best. During the past 2 years, Grammer cooperated with the SCS in planting trial-plots of annual field brome in his peach orchards, and plans to plant more of this grass for cover.

Grammer cultivates his orchards lightly—but not enough to kill his permanent cover crops—with special roto-tillers to get under the trees. This cultivation helps control weeds, insects, and field mice.

He applies limestone, phosphorus, and potash according to soil test requirements before setting out new fruit trees. Thereafter, he applies limestone and boron every 5 years, and adds fertilizer each fall and spring.

Grammer estimates that his production has increased 20 to 25 percent as a result of using modern methods and technology, including soil and water conservation measures.

The Grammers' son, Garry, 17, plans to enter college next year to study horticulture, sales, and marketing so he can return and help his folks run their successful orchard business.

Wind Erosion Control In Vineyards Helps California's Cucamonga Area

By John O. Dean

CONSERVATION farming practices are taming wind erosion in California's famed Cucamonga vineyards.

Chief among these measures are use of volunteering winter-growing cover crops, utilization of pruning residues, and mulch tillage. They are being planned and applied with Soil Conservation Service technical help by grape growers in the West End Soil Conservation District, with which the Cucamonga-Mountain View district was consolidated in January this year.

The author is area conservationist, Soil Conservation Service, Riverside, Calif.

There is more work to be done—in learning the best timing of operations, in improving cover crops, pruning management, and equipment, and in planting windbreaks. But the wind erosion control program in the Cucamonga vineyards has been so successful that a local ordinance has been passed that will bring the last individual growers into it.

The economic and other beneficial results are area wide: Because farmers are more prosperous, business in general is better. Three main highways now stay open the year long, and three main railroads operate without delays in schedules, because sand no longer blows onto the roads and tracks from unprotected vineyards.

Picture a 50,000-acre tract with coarse-textured surface soil thoroughly stirred and dried by winds of 50 to 70 miles an hour, with gusts as high as 100 miles an hour. This was the problem that the SCS was asked to solve in the Cucamonga area of San Bernardino County back in 1937. There were no planted cover crops, and not even any weeds to hold the sandy soil. All grapevine prunings were burned. Under this type of management, farmers would trade sur-

face soil overnight. Blowouts and dunes were prevalent throughout the district.

The present conservation program has developed by painstaking steps from the days when the Cucamonga Civilian Conservation Corps Camp boys demonstrated that dunes could be leveled and blowouts filled by bulldozers—and the wind. Prunings were hauled from the dunes and placed in the blowouts. The wind, loaded with sand blown off the dunes, dumped it in the prunings, thus lowering the dunes and raising the level of the blowouts.

Next, cover crops were planted and, to everyone's amazement, they and the grapes both grew on the scant rainfall moisture. Winter cover cropping became a popular practice. But the disk tillage commonly used erased all the protection so that each fall it was necessary to start over, because the sandy soil was dry, single-grained, and ready to blow again.

In 1941 and 1942, a number of commercial sweep-type implements were brought into use to kill the cover crops and keep the residues on the surface. None of these tools was designed for vineyard use, however, especially where prunings were kept on the soil surface; so the SCS built a specially designed vineyard tiller with sweeps. This implement demonstrated well, but it was not generally accepted by the growers until a late rain in 1947 caused Russian thistles to sprout after the new canes were filling the middles, and the vineyard tiller did the job of controlling the thistle growth.

This experience led to the use of a Canadian-built subsurface tiller that has proved to be a key to the wind erosion control program in the Cucamonga vineyards. It keeps residues on the surface year-long, and keeps volunteering annual seed, such as that of an improved variety of Cucamonga bromegrass introduced in the late

L.—Hundreds of carts formerly were used for burning prunings. R.—Wind blew away about 18 inches of soil before conservation protection.

Today, prunings are used as mulch, along with mulch tillage, to protect Cucamonga vineyard soils against wind erosion.

Cover crop protects this Cucamonga vineyard while soil is blown from clean-tilled vineyard beyond.

1940's, near the surface where the fall rains cause quick germination. The residues protect the tender seedlings until a cover is well established.

The disks are about gone in this problem area. And no longer do you see 200 metal carts burning prunings and the fields kept clean-tilled throughout the year. Now, the prunings are kept in the field, and a roto-beater reduces them to small pieces that do not clog tillage implements. Almost every vineyard produces a cover crop, though some fields still need better cover crops, which are being developed. Virtually all of the farmers' new tillage equipment money is buying subsurface tillers, and many of the growers are using extra money now received from their grape crops for irrigating their vineyards.

Sod—Cover Crops—Contouring Solve Michigan Orchard Problems

By W. D. Miller

Sheet erosion caused by one rain in cherry orchard.

TWENTY years ago virtually all orchards in the famous "Fruit Ridge" area of Michigan were being open tilled and the life of an orchard was in many cases limited by the number of years that a spray rig could be pulled across the gullies. No sod or cover crops were used. Each rain washed deeper gullies in the sloping land.

Today, almost all of the orchards in this west central part of Michigan are in sod. The rest have cover crops between the rows of trees.

When the West Ottawa, South Muskegon, and Northwest Kent soil conservation districts were formed, the problem of soil and water loss in orchards was recognized in each district; and use of sod, contouring, cover crops, and mulch was recommended. Orchard men have served on the three district boards of directors down through the years.

One of them is Kenneth Bull, a charter board member and now associate member of the South Muskegon district established in 1938, and one of the pioneers in the use of terraces and sod cover in orchards. One of his orchards established in the early forties on the contour is still in production.

"Even though modern sprayers make following the contours inconvenient, because occasionally I must go against the wind," he said, "I would still follow this practice if setting out a new orchard on slopes as steep as those where my original orchard is established."

To call attention to the need for sod and other conservation practices on sloping land, the South Muskegon district established run-off plots—still in operation—in the orchard area in 1943, showing the difference in the amount of soil eroded on lands operated with good practices and bad. In 1947, the district board bought 500 pounds of chewings fescue seed and sold it at cost to orchardist cooperators, to encourage sod use.

First to grow this grass in the South Muskegon district, Bull harvested fescue seed in 1949 and sold it to his neighbors for 50 cents a pound. Fescue had been selling for $1.25 a pound. He says today he can't think of an apple orchard that is "bald." Many growers are learning that, with proper management, they also can use grass in peach and cherry orchards.

"There are a lot of good practices Soil Conservation Service folks have taught us," Bull says,

Fred Schweitzer (l.) and Harold Thome examine 4-year-old fescue sod in Schweitzer plum orchard.

The author is area conservationist, Soil Conservation Service, Grand Rapids, Mich.

Erosion in Robert Umlor's orchard in 1938 before he changed from clean cultivation to cover cropping and contouring.

"but if they had never done anything but teach us to use grass it would be worth it. It isn't the gullies that worry me now as I drive through the country—everyone sees them and will try to do something about them. Sheet erosion that takes an inch of topsoil at a time over an entire field is the culprit we must guard against."

Another pioneer in the use of sod, cover crops, and contouring is Robert Umlor in the West Ottawa Soil Conservation District to the south. Before the district was established, in 1938, he tried to slow erosion by filling the gullies with stones and rocks; but each rain took soil and even the rocks down hill. In some cases the roots of the trees were exposed.

His first call for help was directed to County Extension Agent Leo Arnold, who advised the use of sod with straw mulch to help the new seeding get started. SCS employees laid out his original contour lines. By the time the district was started, his farm already was beginning to serve as a conservation example for other farmers in the community.

Today there are no gullies on the Umlor farm. He feels that besides the soil and water saved by a sod cover, it makes it possible for him to raise higher quality fruit with a much better color. Twelve years after he took up soil and water conservation, his apples took first prize at the Michigan Centennial Fair. Today, his only orchards not in sod are those just set out. In these, cover crops are used for the first 2 or 3 years, after which they, too, will go into sod.

When the Northwest Kent district was established in 1946, Lloyd Hill was one of the charter board members. One of the first orchards to go into grass was 20 acres on a farm he bought in 1947 to put into apples. One of the fields had a slope 60 rods long, which had been plowed up and down hill. Close to 95 percent of the orchards in his area were using open tillage—where today he estimates that more than 90 percent are in sod.

He since has expanded until he has more than a hundred acres of apples, pears, and prunes on the home farm. He uses fescue for all of the orchard except 5 acres of prunes, in which cover crops are grown. Straw and hay grown on the other part of the farm are used as mulch under the trees.

"If we had not had soil conservation," Hill says, "we might not even be farming now."

Good sod cover in Anderson brothers peach orchard in Northwest Kent SCD.

Contour Planting—Water Use Serve Florida Citrus Growers

By Howard E. Van Arsdall

SOIL conservation districts in Florida's citrus belt are playing an increasingly important role in helping grove owners in maintaining citrus as the State's most valuable agricultural commodity through the use of soil and water conservation measures.

Not only is the economy of the State affected by the conservation of Florida's soils that are suitable for orange and other citrus production; about three-fourths of the citrus produced in the United States comes from Florida, with the stability of that production accordingly of concern far beyond its borders. Forty-one percent of the State's farm receipts come from the sale of citrus, in the development of which there has been a rapid increase during the last two decades.

Cover cropping, contour planting, irrigation, and drainage are important among the conservation measures Sunshine State citrus growers are using more and more extensively through soil conservation district and small-watershed protection and flood-prevention programs with Soil Conservation Service technical help. One of the most important in many groves is the planting of cover crops, to help maintain organic matter in the sandy soils, to protect young trees from blowing sand, and to control erosion on slopes.

Virtually all groves in these conservation areas now have cover crop protection. Hairy indigo is the most common summer-growing leguminous cover crop, though Alyce clover sometimes is used. Cool-season plants grown as cover are lupine and small grain.

A newly introduced plant, Arshade bristlegrass, that has the ability to grow in dense shade, is being tried in older "canopied" groves where trees have grown until most of the sunlight is cut off from tree middles, causing a problem in getting cover crops to grow as well as particular susceptibility to erosion damage on sloping areas. The Plant Materials Center at Arcadia has produced the seed of this plant and is conducting trials which so far are encouraging.

Another practice in the canopied groves is "hedging" trees in alternate row middles at 2-year intervals. This hedging permits enough sun to penetrate to obtain cover crop growth and also allows easier movement of equipment.

The effectiveness of contour planting on soils and slopes subject to erosion is reflected in the fact that there is approximately 4,000 acres of contoured citrus in Florida. This practice has been used extensively, for example, in the Pasco, Lake, and Hillsborough soil conservation districts.

Reuel Platt in the Pasco district started planting contour citrus 12 years ago and now has a total of 50 acres planted on the contour. C. F. Touchton in the same district contour planted 75 acres 3 years ago following a Pensacola bahiagrass sod.

"I had intended to plant 'on the square,'" Touchton said, "but changed my mind after seeing the erosion damage to an adjoining grove after the rain in the spring of 1960."

I. A. Krusen, also in the Pasco

Contour-planted citrus grove with Argentine bahiagrass strips between tree rows in Hillsborough SCD.

The author is State soil conservationist, Soil Conservation Service, Gainesville, Fla.

Pumping station and ⅛ mile of channel improvement on canal in North St. Lucie River Drainage District watershed project.

district, has a 50-acre contour planting that is 2 years old, in which he grows hairy indigo cover crops in row middles.

Along with contour planting, development of grassed waterways for water disposal frequently is necessary. They usually are protected with bahiagrass, but pangolagrass is equally effective and sometimes is used.

Drainage in citrus groves seldom was used before 1955, because most citrus was on well-drained upland soil. More recent planting of citrus groves on wetlands has increased the necessity for this water-management measure. Open ditches and tile drains are both used.

O. D. Huff, Jr., in the Marion Soil Conservation District in the northern citrus belt has installed tile drains on 119 acres during the last 5 years. He found that after the drains had been in for some 2 or 3 years and the tree roots penetrated the soil to greater depth, the increased vigor made these trees much more resistant to cold damage —an important consideration in the northern part of the citrus belt. A. P. McLeod in the same district has installed drainage in approximately 105 acres in his citrus grove, and says the results have been comparable to those reported by Huff.

The value of conservation irrigation in citrus production also has been demonstrated repeatedly. There also has been a marked increase in citrus irrigation during the last two decades. Particularly outstanding has been the increased availability of irrigation water as a result of watershed conservation project developments. Experience in the Sebastian River project in the Indian River Soil Conservation District is one example:

Within 2 weeks after completion of one structure at the peak of a drought season in March 1963, 13 portable and temporary pumps were pumping irrigation water from a lateral into citrus groves and pastures where many artesian wells had ceased to flow, pasture grasses were dying, and citrus had begun to wilt. Conversion to permanent pumping plants is under way.

One pumping plant, installed several months earlier in anticipation of this water supply, was delivering 24,000 g. p. m. of irrigation water to 360 acres of young citrus. The water stored in the canal by this structure provides a supplemental source of irrigation water that is readily available to 4,200 acres of citrus, 2,800 acres of improved pasture, and an additional 1,500 acres planned for citrus.

After completion of work, also last March, at the pumping station and at two structures in the North St. Lucie River watershed project, there were approximately 14,500 acres of citrus irrigated. There were 50 pumps operating in this canal, pumping an estimated 1 million gallons of irrigation water a minute during the dry season this spring. This irrigation of citrus during the 1963 spring drought will permit maximum production in most of the citrus groves in the area served by this part of the watershed project.

It is estimated that grapefruit production will be between 300 and 400 boxes an acre, and oranges between 200 and 250 boxes an acre. No such production would have been possible without irrigation. The 14,500 acres of citrus represents production by approximately 80 landowners. One of them, Walter Dunn, said that otherwise he would not have any fruit crop, as a result of the drought.

Before completing this part of the project, it was necessary to use artesian water for irrigation; but in the past few years, this water source had been so depleted that it was insufficient.

Florida growers and soil conser-

Summer cover crop of hairy indigo in young citrus grove just before disking and working into soil for improvement and protection.

vationists agree that these and other conservation measures will become increasingly important in the years to come. The temperature requirements of citrus limit the area in which it can be grown. As the demand for citrus increases and more intensive methods of production are used, they foresee greater care will be necessary to protect the limited acreage of soils that are suitable for its production.

Native Pecans Now Paying Crop For Kansas Conservation Farmers

By F. DeWitt Abbott and Luther J. Gaskell

CONSERVATION farmers along several southeastern Kansas streams are turning a bottom land native pecan tree into a profitable crop for themselves and a source of additional employment and income for the area.

A species of the hickory (*Hicora pecan*), the scrub pecan has been growing for years along the river bottom lands of the Marais des Cygnes, Neosho, and the Verdigris and their tributaries, usually well mixed with weed trees and underbrush of various kinds. There were a few improved groves where pecan trees were cultivated for their nut meats, but most of the native woodlands were used for harvesting the better hardwoods.

It wasn't until the 1950's that the new interest in pecans began; and local people mark 1960 as the year that the pecan industry finally came of age, when the pecan nut harvest in this section of the State was about $3 million, at around 30 cents a pound. Now, pecans are considered one of the major crops of the area. It is estimated that approximately 10,000 acres have been cleared for nut production in this area, and more conversion of bottom land woodland areas to nut orchards as part of farm and ranch conservation programs is planned.

Soil Conservation Service technicians have found that the pecan trees make their best growth and attain their largest size on deep, rich, moist soils. In most cases, extensive clearing operations are required. Best yields are from mature trees spaced 70 feet apart. For added value, the grass understory in many of the orchards is being used as pastureland, which does not need fertilization and helps prevent erosion on the frequently overflowed bottom lands.

The processing of the nuts is a growing industry in the area and is bringing in additional income. Well-tended, properly grown trees can produce 800 pounds of nuts each in a good year, and some trees have yielded as much as 2,000 pounds an acre. The average yield, with good management, is a little better than 1,000 pounds an acre.

The Kansas native pecan nuts are in demand from candy makers and bakers. The cracking percentage also is high, averaging about 40 percent, compared to the national average of 35 percent or less. Some Kansas trees yield more than 50 percent meats.

George Elmore of Chetopa, a cooperator in the Labette County Soil Conservation District, began clearing weed trees and underbrush from 120 acres of his river bottom land in 1954. In 1960, Elmore harvested some 12 tons of pecan nuts from his improved groves. Half the nuts customarily go to the pickers. Even so, Elmore netted about $30 an acre from the crop. He estimates clearing costs varied from $50 to $100 an acre. He plans additional selection, thinning, and fertilization to reach top production.

"Prior to treatment my woodlands were a regular jungle," Elmore recalls. "I sold a few merchantable trees occasionally, but the income each year wasn't enough to pay the taxes."

It was a big step for Dale Conard, also of Chetopa, to decide about 10 years ago to convert 300 acres of heavy timber into a pecan orchard.

"I spent nearly $10,000 on machine hire and labor one winter in the clean up," he points out. "But there is good interest on the money, and I expect to pay the investment back in 5 years. Another 40-acre plot was cleared at an expense of $1,500. Nuts harvested the first year paid the bill in full."

The Conards were so pleased with their success that they planted 50 acres of cropland to pecans in 1962, and plan to plant an additional 200 acres to pecans and black walnuts this fall.

The Conards also are using improved pecan grove management, including pest control and mowing the grass each fall to facilitate

The authors are soil conservationist, Salina; and work unit conservationist, Altamont; both of the Soil Conservation Service, Kansas.

Native pecan land on Blackledge farm during clearing—small brush with bulldozer and large trees cut or blasted out.

Cultivation involved in growing soybeans approximately doubled nut yields from pecan trees on Elmore farm.

Elmore grazes part of pecan grove—which he says "was a regular jungle before clearing."

harvesting. To reduce nut losses caused by rodents, birds, and weather, they use tree shakers to speed up harvesting. They also mark trees for removal that fail to produce quality nuts, to make more room for the remaining trees.

Processing the nuts into nut meats is the Conard family's latest expansion move. They bought a small cracking unit in 1962 to "learn the trade." Just learning, they processed 40,000 pounds of nuts last year, and already are sold enough on the business to invest $75,000 in buildings, cold storage, cracking, and processing equipment. The new processing works will employ about 20 people during the harvest season in the cracking, bagging, storing, and shipping of an estimated quarter of a million pounds of pecans and a half million pounds of black walnuts.

Walnuts shells are an important byproduct. Conard has already signed a contract for his 1963 shells, which are used in removing carbon from jet airplane engines. He and his pecan-growing neighbors hope also to develop a market for the pecan shells, which are sometimes used for mulching in nurseries. Even if they don't, they believe pecan farming is here to stay. Confidence in the future of their new industry was bolstered last year by a new buyer's order for "all the meats available of this quality."

Have You Seen?---

● "Rural Recreation, New Opportunities on Private Land," USDA's Miscellaneous Publication 930. This booklet calls attention to facilities and activities already available and others to come on private land close to home. Included are vacation farms and ranches; camps and picnic grounds; community, watershed, or rural-urban projects; swimming and boating; fishing and hunting; winter sports; camping; and nature study.

Grape Growers—Areas

By John D. Kieh

Mrs. E. E. Beers and daughters pick grapes in high producing Yates County, N. Y., SCD vineyard planted on terrace grade in 1945 and annually mulched or seeded to winter cover crop.

CONTOUR planting and other conservation measures are helping the country's grape growers to keep production at a level profitable for themselves and their areas.

In New York, South Carolina, and other grape-growing States, family farmers and larger commercial orchardists alike have turned in recent years to these modern techniques in grape culture, one of the oldest agricultural arts. They are doing so with Soil Conservation Service technical help available through their local soil conservation districts, and with the benefit of agricultural research and extension information in vineyard management.

Take, for example, New York State, which ranks second only to California in grape production:

This State's commercial grape production is found largely in the areas around the Finger Lakes, in the lower Hudson Valley, the Chautauqua-Erie Grape Belt, and in Niagara County. All are near large bodies of water, for maximum sun, warmth, and protection from frost.

In order to take advantage of favorable climate, commercial vineyards are located on a wide variety of soils, and soil conservationists often are confronted with several problems in helping growers with established vineyards. Some were planted up and down the slope so each row would take care of its own water. Others were oriented to the sun with no regard for slope in rows. Serious erosion has been a common result.

"Head ditches" commonly built by hand between sections of grapes frequently were too small to handle the excess surface water, and little or no maintenance made them a liability. Generally, these ditches have been resectioned and enlarged to give improved protection. Other vineyards were planted in level rows with poor drainage, resulting in interference with spraying and plowing, reduced yields, and vine losses.

Although many growers continue to plow their grapes at least once a year and control later weed growth by harrowing or disking, most vineyardists reduce erosion by sowing a winter cover crop at the last cultivation. Hay or straw mulch of about 4 tons an acre is used to prevent erosion, increase rate of intake and water-holding capacity of the soil, and supply potash to the vines.

In setting new vineyards, growers ideally select well-drained, gently sloping sites: but artificial drainage and some land leveling often are used on less well adapted areas. The rows are set on a terraced grade. To assure a good supply of organic matter in the soil before planting, growers often plow down a legume or grass sod before setting a new vineyard.

The grape acreage in New York State has steadily declined, from 62,000 acres in 1930 to about 30,000 acres; but under improved management, yields have been increasing—up to more than 8 tons an acre in the Finger Lakes area—

NEW YORK:—Terraced rows, tile drainage, and annual rye cover crop are conservation measures that helped the growth of this vineyard planted in 1960 in Yates County SCD.

The authors are work unit conservationist, Penn Yan, N. Y.; and conservation agronomist, Newberry, S. C.; both of the Soil Conservation Service.

ain From Conservation

W. A. Mason, Jr.

so that the total tonnage has remained about constant and the present acreage is expected to take care of normal market expansion.

Improved grape production has paralleled the expanded operation of soil conservation districts since 1941. The districts, with SCS technical assistance, have helped growers in the improved conservation management of existing vineyards, and have encouraged contour planting of new vineyards.

South Carolina, which produces approximately 3.6 million pounds of grapes a year, provides another example of how conservation plays an important role in the growing of a crop that is bolstering the income of several thousand farm families and providing added community employment. New impetus has been given vineyard cultivation in this State through an association which assures member-producers a set market for quality grapes, and by a juice processing plant built in Spartanburg by the producers' cooperative for its members.

Of a total of 1,800 acres planted since 1958, about 1,400 acres, or 80 percent, have been laid out in soil conservation districts by SCS technicians, who also give farmers help in planning the installation of soil and moisture conservation measures.

Most South Carolina vineyards are in the Piedmont and Upper Coastal sections, where sloping lands with adequate air drainage are best suited to grapes. They usually are planted with rows graded into grassed outlets for disposal of excess water. W. T. Warlick, Jr., whose 40-acre vineyard is on uniform and gentle slopes in York County, has been successful in planting his vines in straight rows, across the slope.

Spartanburg County, one of the Nation's leading producers of peaches, also is the State's top producer of grapes. South Carolina grows mostly Concord grapes, to meet juice processing plant needs for a variety with high sugar content.

Fairfield County, S. C., SCD Supervisor H. C. Good in his conservation-managed vineyard.

Mrs. Wilbur Taylor, J. G. L. Compton, and Frank Bush are typical of Spartanburg County growers who sell almost all their crop to the local juicing plant, which processes about two-thirds of the State's grapes. Some of Mrs. Taylor's grapes last year had a sugar content of 22 percent, the highest reported to date by the plant. Compton and Bush, both also peach growers, plant 15 acres of grapes each. Compton's 1962 yield was almost 6 tons an acre.

Most producers in the county get a yield of 4 to 5 tons an acre and realize a net income of about $150 an acre, about the same as from peaches. S. C. Gambrell, veteran vocational agriculture teacher in Laurens County, sells some of his grapes locally at about $4 a bushel and the remainder of his crop to the juice processing plant at $80 a ton. Fifty bushels weigh a ton.

Farmers who grow peaches and grapes can use much of the same equipment for cultivating, treating, and harvesting both crops and thus cut down on the cost of equipment. Peaches are harvested from June to August, the season ending about the time the grapes begin to ripen.

SOUTH CAROLINA:—Contoured vineyard on Vernon Grant farm in York County, with vines planted on slightly elevated rows forming miniature terraces.

FRUITS OF CONSERVATION

By Clyde T. Lowe

Concrete-lined ditch across head of orchard and metal control gates to each tree row have cut Daley's (l.) irrigation water use at least 50 percent. Howard M. Roper of SCS (r.).

MORE and better fruit produced at much less cost is Donald Daley's reward for using a soil and water conservation system on his Utah apple orchardland near Payson.

"Proper use of irrigation water and good, careful management in my orchards are the principal keys to quality fruit," Daley says. "Eighty-five to 90 percent of the 15,000 bushels of apples produced in 1962 graded out 'Extra Fancy' and 'Fancy Red' in the U. S. Combination Grading System."

Daley's 52-acre, 16-year-old orchard is on 5 percent slopes on the eastern side of "West Mountain," and contains approximately 2,300 Delicious, Rome Beauty, and Improved Jonathan trees. Peach production also has been good the past dozen years, but the "interplant" of peach trees has been removed.

Daley's principal market is in California, for which his apples are specially packed; but 3,000 bushels of extra fancy Jonathan apples were marketed in Salt Lake City in 1962. Some of the larger trees have produced up to 35 field boxes each, and the average production of Red Rome and Jons' in 1962 was 12 to 15 bushels to the tree. A good crop of Delicious apples was marketed in 1962.

Management of water supplied through concrete irrigation ditches is a big factor in Daley's top fruit production, along with an intensive spray program, an adequate fertilizer schedule, proper pruning, and care in harvesting and marketing.

Before he started cooperating with the Nebo Soil Conservation District 6 years ago, inefficient water distribution and uneven tree growth resulted from irrigation runs extending the entire length of the 60- to 70-rod rows; heavy disking caused severe root pruning adversely affecting tree growth; and excessive loss of soil moisture resulted from the surface soil's being left exposed and vulnerable

Size of apple trees indicates effective orchard management—including cover crop holding soil in place on 5 percent slope.

Note.—The author is work unit conservationist, Soil Conservation Service, Payson, Utah.

to erosion. With the help of the Soil Conservation Service and the County Agricultural Agent, Daley revamped his orchard-management practices.

Today, his irrigation runs have been cut in two. He will catch runoff in ponds and pump it back up the field for re-use. Irrigation is carried out by flooding the entire ground surface evenly. Tree and fruit production over the orchard is rapidly becoming uniform, with less water used.

"Since I have constructed the concrete ditch I receive 'full measurement' at any place along my orchard," Daley has found. "With the water now being delivered all I have to do is see that it is evenly applied. To assure myself of this I now use a soil auger before, during, and after each irrigation. This helps me determine when water is needed, and how much is needed. The auger showed me that I was putting water into the soil much deeper than the 4 to 5 feet required by the tree roots; so I now use a large stream of water for a shorter period of time. I try to maintain that 4-foot root system."

Daley uses four to five irrigations each season, including fall irrigation to insure water for his trees during winter and spring. The 20 to 25 acre-inches of water he now needs for the season compares with approximately 60 acre-inches he formerly used.

"Very little water now runs off my orchards," Daley says, "and I save approximately $1,000 a year in cost of water and labor to apply it. The value of the additional cross ditches is so great that the inconvenience to orchard operation is insignificant."

By eliminating disking—to avoid cutting the trees' feeder roots—and establishing a good cover crop of orchardgrass and sweet clover, the Utah orchardist also has protected the soil with a mulch layer. Dwarf orchardgrass, a new variety developed by the SCS Plant Materials Center at Aberdeen, Idaho, will be used for cover crops in the future. Meanwhile, he is a firm believer in using barnyard manure, as an important factor in the color and firmness of the apples. He applied 400 tons to his orchards last year, supplemented by late fall application of ammonium sulphate.

Conservation Berry Farming—

Formula for Family's Success

By Fred B. Alcorn

IF you like berries visit the Leo Stadelbacher family near Cobden in southwestern Illinois. They grow strawberries, raspberries, blueberries—and tomatoes—on the 80-acre conservation-managed family farm on which they also have raised and educated six sons and two daughters.

This has always been a family business, making use of extra help at peak periods, from the start of strawberry harvest about May 15 until tomatoes are harvested by the end of July. As many as 100 extra migrant workers, some of whom have been returning for the last 17 years, are employed in some harvests. The Stadelbachers have four packing sheds, where skilled workers package the fruit and vegetables in "Blueberry Hill Farm" containers for shipment to market.

The author is work unit conservationist, Soil Conservation Service, Anna, Ill.

Terracing and contouring control erosion and conserve mosture in new Stadelbacher strawberry field.

Stadelbacher bought the first 40 acres of their present farm when he was discharged from the army after World War I and married Mrs. Stadelbacher. Asparagus and rhubarb were the principal crops produced in 1919; but rootrot put him out of rhubarb production after one year. He shifted to tomatoes, raspberries, and strawberries, and continued to grow asparagus for about 10 years, until it ceased to be a profitable crop.

He grew peaches for a while until 1931, when six carloads of

Rye cover crop mowed to serve as mulch between blueberry rows, with irrigation pond in background.

choice peaches didn't net enough on the Chicago market "to buy a pair of baby shoes." Raspberries, however, were so profitable that in 1937 11 acres finished paying for their original 40 acres. Although told they would not live here, he added blueberries in 1949 with plants from Michigan.

The Stadelbacher farm now includes 11 acres of blueberries, along with 20 acres of strawberries, 3 acres of raspberries, and 6 acres of tomatoes. The remaining 40 acres is in grass-legume cover for disease control and soil improvement purposes. The strawberries, raspberries, and tomatoes are rotated with grass-legumes. The blueberries remain indefinitely with grass cover between the rows.

Leo Stadelbacher (center) with son Charles and author examine heavily mulched contour planted blueberries.

Stadelbacher began using soil and water conservation practices in the 1930's when a Civilian Conservation Corps camp was set up at Anna, about 5 miles away. He built terraces and applied other practices with the help of the Soil Conservation Service technicians at the CCC camp and has practiced conservation farming ever since. When the Union County Soil and Water Conservation District was organized in 1947, he became a cooperator and has worked closely with the district.

When the Stadelbachers bought 40 acres more across the road in 1946, it too was put under a complete conservation plan, including terraces with grass waterways, stabilizing structures at waterway outlets, four ponds that supply water for irrigation, use of cover and green manure crops, and proper land use.

Charles, the youngest son, is taking over active operation of the Stadelbacher family farm as his father gradually steps aside.

Norbert, a veteran of World War II, in which his brother Karl lost his life, attends Southern Illinois University and helps in the farm operation.

Robert, who is employed by Agricultural Research Service at Southern Illinois University at Carbondale, raises beef cattle on a nearby farm, and also has been a long-time cooperator with the Union County district. Glenn, who has a Ph.D degree, is a horticulturist for the State of Maryland. Earl graduated from the University of Illinois in entomology this year.

Daughter Geraldine is a business school graduate and housewife. Marjorie is a graduate of Southern Illinois University and teaches art in the East Alton schools.

The Stadelbachers will tell you that sound husbandry, including good soil and water conservation, has helped them achieve both of their goals—to build a successful farm and a successful family.

Timing Peach Orchard Cover Crops To Cut Down Moisture Competition

By C. S. Britt and R. R. Robinson

COVER crops are effective in providing protection from excessive water runoff and soil erosion on the higher sloping lands on which peach orchards usually are planted because good air drainage reduces frost hazards during the spring. But because a vigorous cover crop uses large quantities of water, especially during clear, warm days, there is a problem of preventing competition with the trees for soil moisture during dry seasons.

At Lynchburg, Va., for example, as in most of the Eastern United States, precipitation during the fall and winter greatly exceeds potential evapotranspiration, but during late spring and summer rainfall is less than potential evaptranspiration. It is apparent that competition for moisture is not a problem during fall, winter, and early spring. During late spring and summer, however, water supplies often become critical, and every precaution must be taken to insure efficient use of water.

Cover crops must not be allowed to compete with trees for soil moisture at this time, especially on soils low in available water-holding capacity. In southern areas, where fall and winter rainfall is heavy, winter cover crops will absorb nutrient elements that otherwise would be lost by leaching.

The ideal cover crop is one that becomes established quickly in the fall, forms a good sod, grows rapidly during the cold season when water is abundant, dies before competition for water becomes a problem, and does not harbor insects or diseases that adversely affect peach trees. No one cover crop has all of these desirable features.

Thus grass sods are especially effective in improving soil structure; but grasses start slowly from seed, and fall seedings may not provide a good cover over winter. Rye, although not a sod former, can produce a good soil cover in a short time, if it is heavily seeded and well fertilized. Rye or a mixture of rye and vetch is widely used and is adapted over a wide area.

No. 71

This is the seventy-first of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

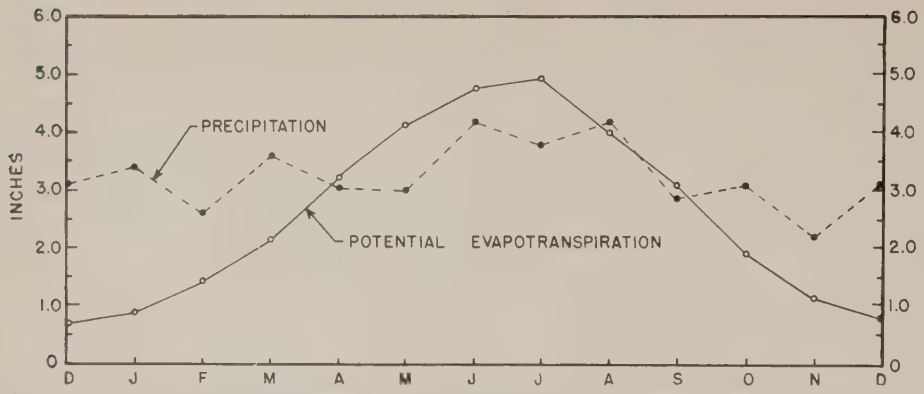
Cover crops should be disked early enough in the spring to prevent competition with the trees for water. The disking should be light, however, so that much of the residue remains on the surface to provide erosion control. This practice is adapted to both old and young orchards. Additional diskings during the summer may be necessary to control weeds.

Orchard plantings that permit contour cultivation as well as cover cropping are particularly effective in soil and water conservation. Recent developments in the use of weed-control chemicals for killing grass sods offer interesting possibilities for maintaining a mulch with a minimum of tillage operations.

Frost hazard is a major consideration in managing cover crops in areas with poor air drainage. The soil serves as a heat reservoir that provides some protection from frost damage to peach blossoms. Any insulating layer, including a cover crop, reduces the intake of solar radiation by the soil, and also reduces the heat transferred from the soil to the air at night. In areas with poor air drainage, a

Peach orchard protected by cover crop on slope where air drainage is good.

The authors are, respectively, assistant to the northeast branch chief and research soil scientist, Soil and Water Conservation Research Division, Agricultural Research Service, Beltsville, Md.



Monthly precipitation compared with potential evapotranspiration at Lynchburg, Va.

vigorous cover crop or a heavy mulch accordingly increases the frost hazard.

In these problem areas cover crops should be managed so that little vegetative growth or mulch cover is present during periods when frost damage is likely. In northern areas, however, a dense winter cover provides protection to peach trees by decreasing soil freezing. This protection is particularly important during the years when there is little snow cover.

Conservation Helps Bring Back Puerto Rico's Coffee Production

By J. F. Marrero

PUERTO Rico's $15 million coffee farming business is being re-oriented on a conservation basis to overcome falling yields and growing foreign competition.

Agricultural research and action agencies of Federal and Commonwealth governments have been at work for the past 10 years to improve and stabilize the coffee industry. Intensive cultural practices, based on sound land use and treatment principles applied through soil conservation district programs with Soil Conservation Service technical help, now promise to restore coffee to a leading position in the Puerto Rican agricultural economy.

Coffee production began to decline, after 1900, because of soil erosion, hurricane damage, and insect and disease damage to trees; and because of increased competition from Brazil, Columbia, Central America, and the West Indies, and from coffee-producing countries in Africa and Asia. Yields fell from as much as 500 pounds an acre reached in 1900 to a low of 150 pounds. Yet Puerto Rico remains the principal coffee producing area under the American flag. In 1961, the island produced 260,000 hundred-weights of coffee valued at $14,900,000. Hawaii also grows coffee.

Six-month-old coffee planted on contour, with hillside ditch for erosion control and banana plants for temporary shade.

Decline in production and low prices discouraged coffee culture for years; but it is still grown on about 160,000 acres on 25,000 farms, 80 percent of which are operated by owners. A labor force of about 24,000 is used during the growing season, and is doubled during harvest in November and December. Another 300,000 people engage in processing, marketing, or other activities that depend in some degree upon the coffee crop.

Children become skilled in hand-picking the ripe coffee berries, and are an important part of the labor force at harvest time. Six municipalities in the coffee-producing zone last year rearranged the

The author is soil conservationist, Soil Conservation Service, Santurce, Puerto Rico.

This sun-grown coffee on contour, with row intervals protected by grass, has produced forty pounds an acre 17 months after planting.

school year to accommodate this demand. After 10 months of school, a 2-month vacation was given at the end of the year. Farm children, who are normally kept out of school for harvest, thus were able to attend a full school term. Last year students harvested 17 percent of the total crop.

Coffee is best adapted to the ruggedly mountainous humid section of central and west-central Puerto Rico at elevations of 500 to 3,500 feet. About half the coffee land has a slope in excess of 60 percent. Eighty inches of rainfall on such slopes creates a severe erosion hazard.

A goal is to increase production tenfold—up to 1,500 pounds an acre. This has been done, at least experimentally, by taking the coffee out of the shade and planting varieties that will do well in the sun, such as Bourbon, Puerto Rico Select, and Caturra.

The tree canopy which shaded the coffee also protected the soil. To compensate for this loss of protection, other conservation practices are used. New plantings are on the contour. A grass or legume crop is planted between the rows. Initial temporary cover may be obtained by planting bananas, plantains, or pigeon peas. Heavy fertilization assures adequate growth and good soil protection.

Field diversion ditches, terraces, and permanent sod waterways give additional protection. Good land use is also a part of the program—the steeper areas go into a permanent woodland cover.

These practices, along with the initial establishment of improved varieties of sun-grown coffee, application of limestone and fertilizer, and control of diseases and pests, are eligible for cost-sharing. A Unified Coffee Conservation Program, supported jointly by the Federal and Commonwealth governments, shares the cost.

Good management practices require proper pruning to provide adequate vegetative growth for the next year's crop. Contour planting has not only controlled erosion, but has permitted some use of mechanized equipment.

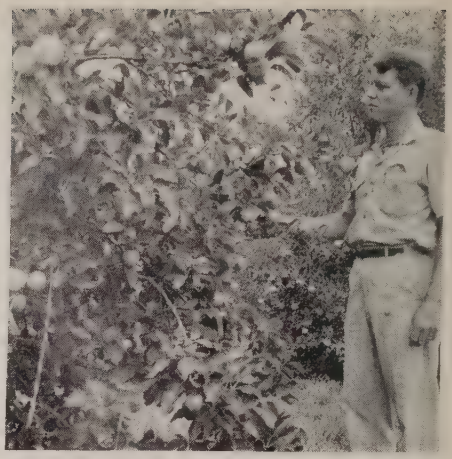
Soil conservation district cooperators request assistance, also, in the development of water supplies for washing and processing the berries before drying and bagging, all of which is normally done on the farm. Water needs are met by the construction of farm ponds, spring developments, and the installation of hydraulic rams.

With an increase in yields and a reduction in per-unit costs, coffee farmers expect to offset the increasing costs of labor and materials and compete in the world coffee market.

Sun-grown coffee planted on terraces with 30-in. base width and 9-ft. vertical spacing on average 38 percent slope.

Good Soil Management Helps West Virginia Apple Grower

By James H. Conklyn



Owner William Kilmer examines fruit on 6-year-old tree.

WILLIAM H. Kilmer's Swan Pond Orchard 4 miles east of Martinsburg in West Virginia's eastern panhandle is considered by local conservationists and orchardists to be an outstanding example of good soil management.

Conservation soil management is geared to efficient management of dwarf-type apple trees, with which Kilmer is gradually replacing 103 acres of old and mature apple trees in the orchard. With the help of Soil Conservation Service men working with the Eastern Panhandle Soil Conservation District, he has become thoroughly familiar with the soils on his farm and with their drainage and fertility status, and applies fertilizer according to the need shown by soil tests.

Swan Pond Orchard is operated according to a detailed soil and water conservation plan. For example, in establishing a new orchard, Kilmer first removes old tree roots and stones with a ripper and, after the ground is smoothed down, seeds a cover crop of soybeans or rye.

Tree size and fruit in this 6-year-old Swan Pond apple orchard resulted from using high-nitrogren alfalfa mulch.

The young trees are set in the early spring, and annual cover crops are grown for another year to permit additional smoothing of the land. During this period, alfalfa mulch is hauled from other areas to mulch the young trees. Then Kilmer seeds an alfalfa-grass mixture to produce mulch needed to supply the plant nutrients and to conserve moisture for the next 5 or 6 years.

He has found that a young orchard that is well mulched generally needs little or no fertilizer. He has trees 8 years old that have had no fertilizer of any kind for 4 years, and their growth and tonnage of fruit are excellent. Trees mulched with the alfalfa-grass, which has been well fertilized, start to bear fruit for harvest in 6 to 7 years. This is 5 to 6 years earlier than the average for this locality.

Soil organic matter is most important in Kilmer's soil management program. He leaves small limbs pruned from trees around the trees and maintains vigorous bluegrass sod in the established orchard.

Efficient planning and management are not limited to orchard soil management. For example, all young trees set in the Swan Pond Orchard were propagated at

Grafted dwarf apple trees to be used in replacing old trees in Swan Pond Orchard.

The author is work unit conservationist, Soil Conservation Service, Martinsburg, W. Va.

the orchard. Kilmer points out that by doing his own grafting and budding he is sure of the variety he is planting. This home propagation also provides some winter work for his workers.

Kilmer uses "May poles" with binder twine instead of wooden props to hold up limbs full of fruit. The poles and twine stay in place, eliminating hauling and replacing the props each season.

Cover Crops Prevent Erosion—

Produce Tastier Fruit

By John Dixon

ORCHARD Mesa in western Colorado near Grand Junction is well named. Here grows an abundance of peaches, apricots, apples, pears, and cherries.

They used to think that the fruit here couldn't be better. But it is getting better, thanks to a simple conservation practice—cover cropping the orchard floor. Not only does the cover prevent erosion in orchards on the gently sloping mesa and help retain soil moisture, but it helps supply and hold the chemicals that orchardists say produce tastier fruit.

For example, Fred Harbert, one of the first orchard men in the area to change from clean cultivation to cover, considers this step one of the most significant advances in his 30 years of fruit growing. He believes cover cropping improves the fruit quality as well as the total yield.

"The best indication I have of this," he said, "is that the demand for the fruit from my place seems to be growing year by year."

Harbert, a supervisor in the Upper Grand Valley Soil Conservation District, uses combinations of cover crops on his 38-acre orchard, each suited specifically to the type of fruit growing overhead. For example, a combination cover crop of equal portions of alfalfa, yellow blossom clover, and orchardgrass is planted in the apple orchard. The alfalfa and clover supplies additional nitrogen. The orchardgrass releases phosphorous and potash for better color.

Harbert does no disking in the growing season. He harvests the cover crops with a roto-cutter similar to a rotary-type lawn mower but larger. He also uses the implement to mulch prunings and return them to the soil. He uses fertilizer with the cover crop —1½ pounds of ammonium sulfate to each tree a year and barnyard manure every third year, when it is available.

Water management also plays a major role in Harbert's conservation orchard management. The length of his irrigation runs is from 330 to 475 feet, and irrigation time does not exceed 12 hours. Harbert uses an irrigation probe to help determine when enough water has been applied. Little runoff water is allowed to leave the farm, because his irrigation system is arranged so that the water can be used on other fields.

Harbert's conservation plan, developed with help of the Soil Conservation Service through the Upper Grand Valley district, also calls for concrete irrigation head ditches and underground pipelines for water control to be completed in 4 years.

Harbert (l.) and author inspect cover crop in Harbert apple orchard.

The author is soil conservationist, Soil Conservation Service, Grand Junction, Colo.

Terraces Stop "Wet Feet" In Ohioan's Peach Orchard

By Earl P. Carlton

Tom Quick (l.) and Robert N. Duncan of SCS with peach trees on terraces.

HAS the old adage "you can't grow stone fruit on wet, heavy soil" stopped you from growing peaches and cherries? Tom Quick, owner of one of the largest orchards in northeast Ohio, has developed a satisfactory method of growing these fruits on his own heavy soils, thus proving that old adages can get out of date. His solution—terraces or terrace-like ridges.

Quick's 200-acre orchard is 3 miles north of Cuyahoga Falls in Summit County. The entire orchard is on imperfectly drained and moderately well drained silt loam soils. These soils have a medium textured topsoil with a tight, heavy subsoil. With this condition, the water table tends to stay close to the surface. The orchard would produce fine quality apples and pears, but peach trees would live only a few years. The problem was apparently one of "wet feet." Tile drains were tried. However, it was found that trees within a few feet of the tile would live only a few years.

After several unsuccessful attempts to start peach orchards, Quick called on the Soil Conservation Service through the Summit Soil and Water Conservation District, in which he is an active cooperator, to see if some solution could be worked out. In 1956, standard terraces were built on a 6-acre field before planting it to peaches.

The terraces were spaced 75 feet apart with a gradient of 0.6 foot fall per 100 feet. One row of peaches was planted on the terrace crown, with two rows planted between the terraces. Ninety percent of the peaches planted on the terraces survived the first growing season, but trees planted between the terraces had only 35 percent survival.

The next year, ridges similar to terraces were constructed between the terraces. This measure resulted in a 90 percent livability, proving to Quick's satisfaction that the main idea was to keep the tree's roots as high above the water table as possible. He also has excellent overall conservation of soil and water in his orchard.

A second experience confirmed the effectiveness of the conservation structural work. In 1958, Quick removed a 6-acre portion of old apple orchard and, after careful land preparation, liming, and fertilizing, planted it to peaches. In the spring of 1959, only 25 percent of these trees were still alive. Later he put in ridges similar to those used in terraces in the same field. They were spaced across the slope 30 feet apart, and the peach trees were spaced 25 feet apart on the ridges. The use of the ridges resulted in nearly 100 percent live trees and maximum erosion control.

Quick's orchard management practices also include soil tests made every 5 years, liming and fertilizing to maintain good sod and new tree growth, and a complete spray program to obtain top quality fruit.

L.—Tree roots are surrounded by the water table when planted on level ground. R.—When tree is planted on a terrace crown, roots are better able to grow and survive above water table.

The author is work unit conservationist, Soil Conservation Service, Cuyahoga Falls, Ohio.

New Orchard for Old

Pays Off for Oregonian

By Robert R. Lonzway

WHEN Frank Hooker's orchard near Milton-Freewater, Oreg., froze out in 1955 he turned to new tree-growing and conservation management practices that put him back into paying production well ahead of the normal time of about 7 years.

The big freeze took out around 4,000 acres of orchards in the Walla Walla valley. Most growers cleared away the dead trees and immediately put in new ones. Hooker decided to wait a year and get better prepared for planting his new orchard. Here is how his extra work paid off:

His 6 acres of cherries yielded 1,000 pounds in 1961 and jumped to 5,000 pounds in 1962. At the same time, 4 acres of apples went from 250 to 720 boxes; and 7 acres of prunes from 12 tons in 1961 to 32 tons in 1962.

The Soil Conservation Service soil survey for the East Umatilla Soil Conservation District, of which Hooker is an officer, showed his gravelly and cobbly soils to be excellent for orchards in contrast to diversified farming. He began his planned orchard rebuilding by subsoiling the old ground four times. It was choked up with dead roots and was packed hard from past cultivation.

Hooker with sprinkler system structure and orchard in 1961.

Hooker established his new orchard in 1958. One practice he used, called "tipping," was to break off the ends of limbs to get a more dense and determined tree growth. Another was to plant a green manure cover crop of Austrian winter field peas in the fall of 1959 and turn it under in the spring of 1960 near the full bloom stage. Hooker also had an irrigation water distribution problem.

Source of water for his sprinkler system is one of many community ditches carrying debris and weed seeds in the water. He put in structures to screen the water, and hasn't had a plugged sprinkler since.

The sprinkler main line of concrete-asbestos pipe was installed with particular care to "bedding," or covering and anchoring the pipe. The structure and pipeline with risers were cost-shared with Agricultural Conservation Program funds.

Hooker put in S-143 orchardgrass for a cover crop. About an acre of the orchard was seeded in April 1961 to an evaluation planting of 5 legumes and 11 grasses, in mixtures and singly. The plan for 1963 called for leaf-analysis and a study of yield and quality of fruit in the evaluation planting.

Hooker has found that the amount and kind of fertilizer to use must be based on common sense and good judgment. Knowledge of the soil, irrigation frequency, management and observation of trees, and cover crop condition are some of the factors involved in planning a fertilizer schedule. Orchard trees are individually fertilized under their drip area in late December or early January. The cover crop receives a minimum of fertilizer in April or May.

The Hooker orchard in fall of 1962 with cover crop of S-143 orchardgrass well established and "Maypoles" in place.

Fertilizers are varied but all include nitrogen. In early May 1962, 22.5 pounds of available nitrogen was broadcast on the orchard. Hooker says sometime in the future one broadcast application on the whole orchard will do for trees and cover crop.

Over a 2- or 3-year period, this Oregon orchardist makes money on the cover crop, something he couldn't do with clean cultivation or a native cover crop. The last 2 years his orchard has been ready for picking 3 to 5 days earlier than nearby orchards.

Hooker is an advisory supervisor and treasurer to the East Umatilla district board of supervisors, and in 1961 he was selected Conservation Farmer of the Year of the district. He also is active in the Blue Mountain Horticulture Society.

The author is work unit conservationist, Soil Conservation Service, Milton-Freewater, Oreg.

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Wenatchee Orchards Take To Cover

MOST orchardists in the Wenatchee, Wash., area sooner or later come to consider cover crops as a must in their operations. The reason: They control soil erosion, improve organic matter and nitrogen content of the soil, make irrigation water more available to the trees, and improve fruit color. Cover cropping is one of the conservation measures growers plan and apply through their soil conservation district programs with technical help of the Soil Conservation Service. As Bob Garrett, a cooperator in the East Wenatchee Soil Conservation District says:

"Fruit color in this area has always been a problem until cover crops were used. By controlling nitrogen with the cover our fruit color has been improving every year. Soil on my orchard has really developed organic matter from red fescue cover crops. When orchards are sprinkler irrigated, moisture stays in the root zone instead of passing beyond the tree roots' reach, taking valuable fertilizer with it."

Rates of seeding and varieties vary from orchard to orchard, because cover crops are used for different reasons on different soils.

Gully erosion from winter runoff in orchard seeded too late in fall to establish cover. It since has been protected with creeping red fescue grass planting.

This cover crop in strips planted in young orchard in May showed this growth by August. A mixture of 6 pounds of alta fescue and 3 pounds of Ladino clover was used.

Photo picture story by David E. Roach, formerly soil conservationist, Soil Conservation Service, Wenatchee, Wash.

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Soil Conservation

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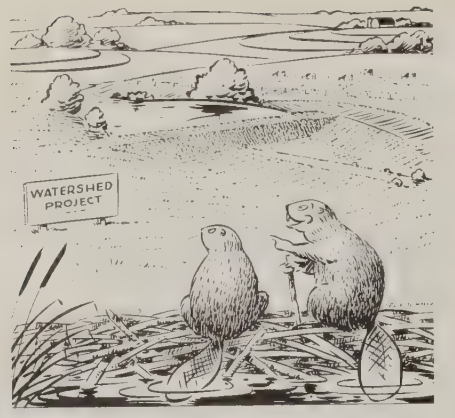

Soil Conservation
25 Years Ago

"Conservationists may well ponder and study the agriculture of Peru in its development of crop plants and in the adaptation of sustained land use to steep, mountainous slopes. . . .

"The fertility of the alluvial soil in the valley bottoms, frequently renewed by deposits of mud from the streams in flood, must have encouraged the development of continued agriculture with crop production year after year on the same lands. The spreading of water from the streams onto land it would not otherwise reach, as was evidently done before the Inca times—probably A. D. 1000—not only made it possible to raise crops during times of little or no rainfall but assisted in maintaining the fertility of the soil on those areas also. As population increased, more and more land was so irrigated, streams were narrowed and straightened by the construction of stone walls, and terraces with stone retaining walls, likely used first in valley bottoms as a means of holding soil during floods, were extended farther and farther up the slopes."

COVER PICTURE.—Soil and water management to live by marks the 220-acre, contour striperopped farm of Ray Hecksel near Watertown, Minn. The marshy area at the right is reserved for wildlife—pheasants, ducks, and some deer—and Oak Lake in the foreground provides boating and other recreation.—Photo by Erwin W. Cole.

VOL. XXIX, NO. 3 OCTOBER 1963

CONTENTS

Page

51 Our Unseen Waters
By Donald A. Williams

53 Alfalfa-and-Grass Saves Moisture—Controls Erosion
By Stanley Bannister

55 Water—The "Stuff That Keeps Them Going"
By Warren J. Brown

56 Conservation Orchards Bring People and Money
By Robert E. Lee and Arthur J. Amundson, Jr.

58 "Bedded" Lands Solve New Yorker's Hay Problem
By Charles B. Woodruff, Jr.

59 Our Soil-Moisture Reservoir
By Cecil H. Wadleigh

61 Windbreaks: Reduce Evaporation—Wind Erosion
By Elmer L. Worthington

62 Irrigated Area Profits from Soil-Water Management
By Clifford L. Merrill and W. Bradford Hatch

64 Southeastern States Move Out on Water Problems
By J. A. Johnson

65 Farmers Develop Water for Recreation and Wildlife
By Hans G. Uhlig

67 Barrel Risers Cut Underground Irrigation System Cost
By Leon R. Hubbard

68 Seepy-Pastures Springs Pay Off for Ohio Farmers
By Adrian Achtermann

69 "Moisture Accounting" Method for Irrigation Tobacco Growers
By Sam Cole

70 Conservation Farm Pond Water Used To Fight Mill Fire
By H. H. Odell

71 Book Reviews

Soil Conservation

ORVILLE L. FREEMAN
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Rural Development and Conservation

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FRANK B. HARPER, Editor

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OUR UNSEEN WATERS

By Donald A. Williams

THE vast distribution of our life-giving waters out of sight in the soil and deeper underground is brought home to us in the above illustration of the hydrologic cycle. It confirms again the principle that soil and water conservation are inseparable.

An average of 30 inches of water falls on the land in the United States as rain or snow, though the amount obviously varies—from 120 inches in parts of the Pacific Northwest, for example, to less than 5 inches in areas of the arid Southwest. But nearly three-fourths of our average water received—21 inches, or 70 percent—is evaporated from the surface, or is transpired by plants from the water that disappears into the ground.

Eight of the 30 inches of water finds its way to the ocean, mainly by way of surface streams; and 1 inch is used up by agriculture and industry in its journey from land to sea. These figures, again, vary widely, as determined by climatic, soil, land-use; and other conditions in a particular location.

When we think about it at all, many of us think of the water we can see and feel. We are concerned with the water we have at hand to use for our personal drinking and other needs; for recreation; for irrigating farm crops, our lawns, and our gardens; or for electric power generation and other uses. Yet, we depend first of all upon water stored in the soil to produce our essential food crops, grass for livestock and wild game, and timber for shelter and other purposes.

Amounts of soil water used by a crop or other plant vary, of course, under different climatic, soil fertility, and other conditions; but the following estimates point up the fact that the demands by growing vegetation on our unseen

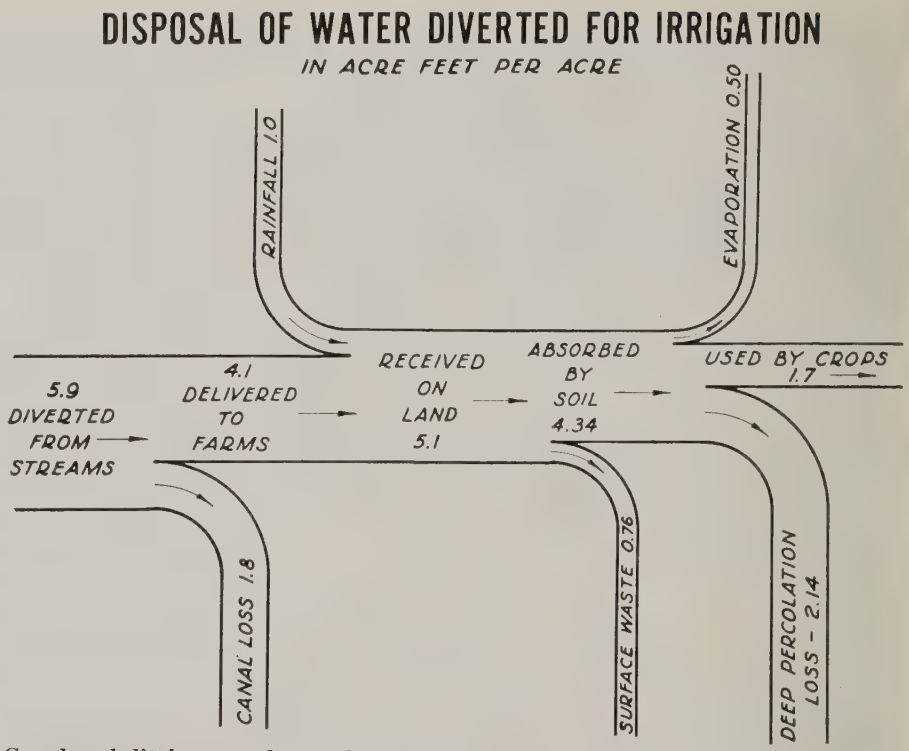
The author is administrator, Soil Conservation Service, Washington, D. C.

water are major: Alfalfa, 850 pounds of water to produce 1 pound of dry matter; wheat, 505 pounds; corn, 372 pounds; sorghum, 271 pounds; and cotton, 562 pounds. Trees likewise use even larger amounts of water—as much as 1,000 pounds per pound of dry wood.

How much of our total water supply is available for crops and livestock, municipal and industrial purposes, wildlife, recreational, or other use depends upon our ability to intercept the precipitated water as it moves endlessly to the ocean in surface streams or through the soil and underground in the course of the hydrologic cycle. It is the amount of available, usable water that counts, and that depends upon the insoak and runoff of each watershed. Water management, then, begins with land management.

Sixty percent of the Nation's land area is in farms and ranches, interspersed in the West, principally, by public forest and grass lands. It follows that most of our water falls on farm, ranch, and forest lands. How farmers, ranchers, and woodland owners deal with that vast land surface accordingly determines in large measure the quality and quantity of water that will be available for American agriculture, for rural areas and urban, for industry, for wildlife, or for recreation. It is on these agricultural watersheds, including their associated mountain divides and public lands, that the destiny of our water supply and land resources is being worked out.

It is there—through farmers' soil and water conservation districts, community watershed organizations, and other local means—that modern techniques of sound water conservation, management, and use as related to farm, forest, and other lands are being employed so effectively. This with technical, cost-sharing, and other assistance of the Soil Conservation Service and other U. S. Department of Agriculture agencies in cooperation with all local, State, or Federal agencies or private interests concerned.



Canal and ditch water losses from seepage are more than 50 percent in many instances.

With our growing population and increasing per capita use of water, we have to think in terms of maximum use of all the water we have, some of it not once but many times over. Water use in the United States, exclusive of that used to generate power, amounted to 240 billion gallons a day in 1955, as recorded in the 1959 report of the Senate Committee on National Water Resources. This report, which for the first time provided us with a really comprehensive national look-ahead at our water resources and needs, said water usage could be expected to be nearly double in 20 years and triple by the year 2000.

Significantly, the report showed 20 percent of the 240 billion gallons used in 1955 was ground water. Still more significant are such findings as that ground water was removed in 1958 from 25,000 acres in the High Plains of Texas and New Mexico 140 times faster than it was being replenished.

Soil and water conservation measures are proving their ability uncounted times over to mitigate waste or depletion of surface, soil, and ground water alike. They work together to make water available where it is needed on field, farm, and watershed in amounts needed, when it is needed. Thus grass and legumes in crop rotations, contour tillage, grazing rangeland within the sustained carrying capacity of the grass, and similar management and use of woodlands all help to hold water in the soil for optimum plant growth.

One of the major contributions of conservation to husbanding our water supplies is through improvements in the efficiency of handling irrigation water. Agriculture makes approximately 60 percent of the total "withdrawals" of water from streams, lakes, and wells for all economic users. Because of this most agricultural water is used for irrigation, and because a high percentage of irrigation water is evaporated or used in building plant tissue, agriculture accounts for

nearly 95 percent of the "consumptive use," or disappearance, of available water supply.

Studies by the Agricultural Research Service and the Soil Conservation Service show that, in the absence of conservation irrigation practices, sometimes only 25 to 50 percent of the water withdrawn is made available for crop growth. By contrast, conservation irrigation systems installed according to standards in use in soil conservation districts regularly attain efficiencies of 60 to 70, and sometimes 80, percent.

These water-conserving measures include irrigation farmers' adjustment of cropping plans in accordance with the amount of snow water forecast for the season's streamflow and reservoir storage, land leveling to obtain better use of water in the fields, lining ditches to cut down on water seepage through earthbanks, improved drainage to prevent too high water tables that result in waterlogging and salt accumulation, and re-use of water through on-the-farm storage and groundwater recharging devices.

The most spectacular contributions to efficient and orderly utilization of our water supplies for agriculture and our other everyday uses are in the rapidly spreading watershed protection and flood prevention treatment and management of the Nation's approximately 8,000 small watersheds shown by the Conservation Needs Inventory to be of a size suitable and needing project action for one or more purposes. The needed projects would embrace nearly a billion acres, or half the land area of the United States.

A watershed that is adequately protected by vegetation, or by other soil and water conservation measures on the land, and by small dams or other structures to slow down the flow of surface runoff water, also more nearly assures the availability of soil water and ground water where and when it is needed, both upstream and downstream. The water intake by the watershed soils is stabilized at the optimum rate needed by trees, grass, or cultivated crops, and to maintain water supplies for springs, stockwater ponds, and upstream reservoirs. At the same time, there is a more even and dependable flow of underground water down the watershed to supply water to major downstream reservoirs and to meet irrigation or other water needs at the lower end of the watershed.

In the East or in the West, water problems are, in the last analysis, watershed-wide problems. Landowners and other water users at the upper end of the watershed and those at the lower end all are affected by what happens to the water of the whole watershed, and accordingly have a common stake in its treatment and use.

The Soil Conservation Service recognizes this fact and seeks the ultimate possible balance, consistent with technical soundness and the requirements of State laws and other directives, in its farm and watershed assistance. To this end, it employs specialists in hydrology and geology, in addition to soils, plant materials, engineering, and other technical people.

The facts show that as a Nation we can meet our water needs. We can avoid "water bankruptcy," just as we have been able to cope with the menace of soil erosion. But to do so, we need to move ahead with the concerted efforts in management of our water—above ground and below ground.

Palouse Farmer's Alfalfa-and-Grass Saves Moisture—Controls Erosion

By Stanley Bannister

ALFALFA-and-grass is king in the water saving and erosion control crop rotation used by George Gault on his dryland farm in the eastern Washington Palouse.

That was not the case, though, when he took over his father-in-law's farm and attended 1947 group meetings sponsored by supervisors of the Central Whitman Soil Conservation District, at which a Soil Conservation Service technician explained how farmers in the Palouse country could deal with their problem of costly soil losses.

Each year during spring runoff, the little trickle that people called the Palouse River became a mud-toting giant. The villain in this annual tragedy—according to the technician—was the time-honored practice of summer fallow, in which 2 years were required to produce one wheat crop.

Stubble burning still was practiced on many fields, where the ground then was worked fine and clean like a garden. The wheat, usually planted in the fall of the second year, seldom grew dense enough to protect the overworked soil from slashing winter rain-

The author is engineering technician, Soil Conservation Service, Colfax, Wash.

storms and snowmelting "chinooks." Water that couldn't soak into the ground torrented down the long, steep slopes, frequently carrying 50 tons of topsoil an acre with it on its way down myriad gullies into the small bottom-land streams.

A college graduate and a chemist by profession, Gault was challenged by the thought that each year Nature dropped an average of 18 inches of moisture on the land which he planned to farm. If he could catch that water and put it to good use, he could grow a paying crop each year on every acre. But, to make good use of that water, he knew that he also would have to provide a good balance of water-soluble plant foods.

George Gault, Jr., inspects rough-plowed seedbed with James Hansen of SCS.

Looking around on other district farms operated under conservation plans, he saw that rough tillage and good, fibrous plant residues helped the earth sop up water. He also liked a legume's built-in "chemistry lab," and understood that effective conservation rotation had to be centered around grass and legumes.

The spring of 1947, he planted a field to sweetclover and grass; and, as he acquired a few head of Hereford cattle, he started alfalfa and grass. After 6 years, when sweetclover got too many sicknesses to grow well in the Palouse, he switched completely to alfalfa and grass. That meant more cattle.

"It was my Scotch ancestry," he explained. "I just couldn't see all that good forage go to waste."

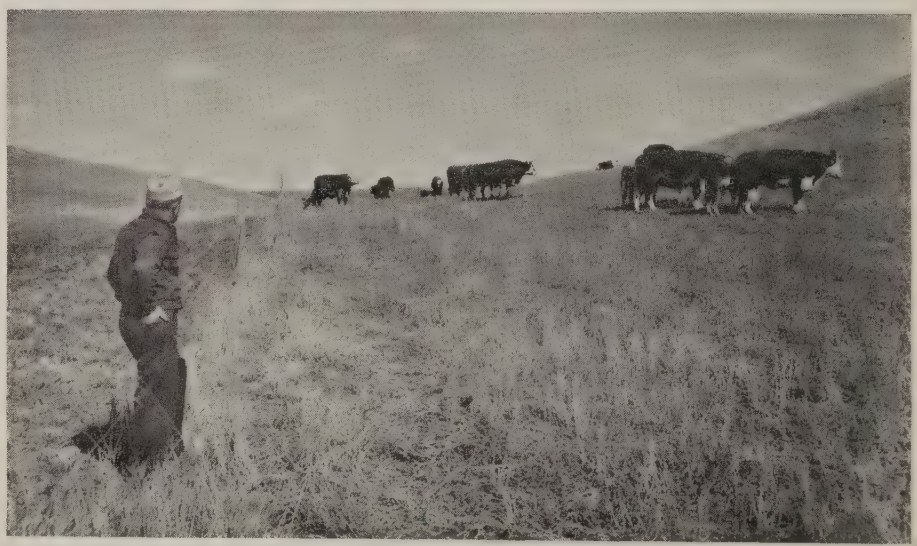
Today, the Gault herd has grown to 60 cows. One hundred and fifty acres of alfalfa and grass supply them weight-producing hay and pasture the year around. After a summer's grazing, there is still plenty of top growth to protect the hilly land from erosion.

Gault likes alfalfa in his rotation for several reasons: It adds humus and nitrogen to the soil for later crop use. It has long, tough roots that bring up minerals far below the reach of ordinary plants. Those roots also are efficient subsoilers which prepare the ground for penetration by the weaker roots of cash crop plants.

"I buy lots of nitrogen fertilizer," Gault explains. "But I find that after alfalfa-and-grass has been grown, the land is always more responsive to applications of commercial fertilizer than it was before."

His rotation is flexible, so crops grown can be geared to fluctuating market needs. A typical rotation might go 9 or 10 years. To keep from too much costly fence moving, he usually leaves alfalfa-and-grass 5 years before plowing it out. Then he makes sure he has a cloddy seedbed that leaves the ground like a giant sponge waiting to sop up the winter rains and trap wind-drifted snow.

For these and other good farming practices, Gault was named "Mr. Conservation Farmer" of the Central Whitman Soil and Water Conservation District in 1952.



Gault's Hereford cattle thrive on this Ladak alfalfa and intermediate wheatgrass pasture.

WATER—

The "Stuff That Keeps Them Going"

By Warren J. Brown

1961.—Old wood and metal Tovera flume before being replaced.

THE people of Pine River Valley in southwestern Colorado look on water as the "stuff that keeps them going."

Water from the river keeps the earth green in summer, makes hay and pasture lands produce, and furnishes highly valued recreation and family enjoyment. But to the people who use it in the valley, water seems to grow scarcer year by year; and each year it accordingly becomes more and more precious to them. That is why the business of conserving the water supply from the melting winter snows in the high mountains, and making it perform its services more efficiently as it passes downstream, is growing in importance.

And that is why the Pine River Soil Conservation District has assigned top priority to water conservation and proper irrigation water management. Irrigation farmers are being urged to replace wornout wooden structures with permanent, efficient water-saving systems and devices. The district board's objective is to put every drop of the supply to efficient conservation use.

The board arranged with a Colorado Springs supplier to furnish needed pipe, headgates, and Parshall flumes at a saving to the local farmers. The rate of installation has increased five or six times. The water-conscious irrigation farmers are becoming increasingly aware of the importance of accurate measurement of the water they apply to their fields, and find the flumes to be a useful measuring device.

During the summer of 1961, Aaron Harper replaced a wooden flume on his farm with a modern concrete siphon. When it was completed and working, Harper said: "It sure is good not to worry about

1962.—Dike carries Morrison Ditch over 60-in. concrete undershot pipe.

The author is work unit conservationist, Soil Conservation Service, Ignacio, Colo.

the old flume falling down!''

During the same period, the Pine River Canal Company asked the district for advice in replacing the flume across Sambrito Creek. The flume appeared to be about to fall, and it was wasting water. The district proposed a concrete siphon, which was installed by a New Mexico firm and already has brought a substantial saving in water for users downstream.

The Morrison Consolidated Ditch Company asked the district for help in planning a structure to replace its Tovera flume. Soil Conservation Service engineers recommended an undershot and compacted earthfill. The structure was completed the summer of 1962, and is reported by Robert Klusman, a company official, to be satisfactory.

Rodney Pargin, a Pine River farmer and a supervisor on the soil conservation district board, pointed out that the district has much still to accomplish in the conservation of water in the area.

''But the progress we have made is encouraging,'' he said. ''Everyone is working enthusiastically with the board in reaching our goal.''

Kickapoo Conservation Orchards Bring People and Money To Valley

By Robert E. Lee and Arthur J. Amundson, Jr.

CONSERVATION management is helping the ridgetop orchards along the Kickapoo River valley in western Wisconsin better fill their role in development of Crawford County's resources.

Thanks to such land-use measures as sod cover and contour tree planting, flash floodwater no longer strips away topsoil and cuts raw gullies in the orchard area; and today these orchardlands contribute little runoff or silt to the river's often rampaging flow. The eight commercial orchards all are cooperating with the Crawford County Soil and Water Conservation District, through which Soil Conservation Service technical help is available.

There was a time, though, when things were different. As Jim Kegel, orchardist and lifelong resident of the county, recalls: ''I remember, as a boy, seeing man-sized boulders washed out of the gullies below the orchards.''

Early orchards were clean tilled under the trees, and annual crops of potatoes, oats, or, in some cases

Pioneer Orchardist Ben Twining's daughter, Leita Twining Slayton, and Jim Kegel at marker above Gays Mills commemorating establishment of Kickapoo orchards.

strawberries, often were planted. In many instances, clean cultivation was complete. The land was disked several times each season. As a result, the oldest orchards still have trees growing on mounds —evidence of the soil lost in earlier days.

Present-day management includes permanent sod cover in all the orchards. Rather heavy fertilization also is done regularly. Most of the orchards planted since 1955 are laid out on the contour. As these changes to conservation land use took place, the land became more able to soak up the thunderstorm rains. Gullies became inactive and are gradually healing—occasionally with the help of a bulldozer. No longer are raw rock washes moving boulders down to the valley below.

Meanwhile, annual production of apples in the Kickapoo orchards averages some 300,000 bushels, with a peak potential estimated at 400,000 bushels. Roadside sales account for an average of 25 percent of the apple crop, with some orchardists reporting as high as 60 percent sold in this way. Wholesale outlets are mainly in Milwaukee, Chicago, and St. Paul, and there is another substantial market for Kickapoo apples in Winnepeg, Canada.

Thousands of people tour the orchards each spring to see the snowy bloom; and every fall more people come to Gays Mills for the apple festival sponsored by the Lions Club. The extent of the tourist business created by the orchards is hard to establish precisely, but the local economic impact clearly is considerable. Moreover,

The authors are area conservationist, La Crosse, and work unit conservationist, Gays Mills, both of the Soil Conservation Service, Wisconsin.

James Fleming's contoured orchard with sod cover makes for easier use of such heavy equipment as this 4-ton power sprayer unit.

25 people have full-time employment in the local orcharding operations, and several hundred are employed in picking, sorting, and packing in the season.

Other fruit crops — cherries, raspberries, grapes, and some pears —are raised in the area, but usually not in commercial quantities. Cherries, for example, are sold on a "pick-your-own" basis. Each spring, hundreds of post cards are sent to out-of-State and other customers advising them of cherry-picking dates.

Success of the Kickapoo apple orchards, in which some of the trees are 45 years old and still producing, may be credited in no small measure to the enterprise of two early promoters of the development. They were John Hays, an officer of the Wisconsin Horticultural Society, and Ben Twining, who was to be elected one of the supervisors when the Central Crawford Soil Conservation District was formed in 1938. In 1905, they collected apples from 8 or 10 farmers in the Gays Mills area and exhibited them at the Wisconsin State Fair, where they were awarded first prize. These same apples again won first prize for the Horticultural Society, at a national apple show in New York.

These and other experiences led the Wisconsin Horticultural Society to push commercial production, with establishment in 1908 of a 5-acre State trial orchard. Some of the original trees still remain on this land, now owned by Kegel. In 1911, an organization was formed in Gays Mills which successfully promoted the establishment of orchards through two companies. By 1916, there were 800 acres of apple trees and 100 acres of cherries and plums. Today, the acreage in productive orchards is only slightly higher, but includes more apple trees.

Records of the Crawford County district show 216 acres of contour orchards, to complement its 60,000 acres of contour strips on surrounding cropland. More of the land can be used safely for orchard planting when rows are on the contour, because there is less of a hazard for equipment operation.

Contour rows also prevent getting stuck with heavy sprayers, and have done away with the deep corners that used to exist with the old square system of planting. A system of roadways following the ridge tops connects all contour rows and provides high, dry, and gently sloping grades easy to negotiate, even with a heavy load of fruit.

Five-year-old Fleming orchard entirely on the contour provides appropriate background for "Orchard View" School.

◆

Oklahoma State University research indicates that ultraviolet light is satisfactory for the disinfection of water supplies from a farm pond filter installation. A 30-watt ultraviolet light unit would control normal contamination effectively at a 2-gallon-per-minute waterflow.

"Bedded" Lands Solve New Yorker's Hay Problem

By Charles B. Woodruff, Jr.

A SYSTEM of "lands" or "beds" with water interceptor and conductor ditches has assured Philip Rabideau in New York's Clinton County Soil Conservation District good hay crops while repaying the $80 an acre cost of the conservation improvement in 2 years.

Rabideau is one of several "north country" farmers along the shores of Lake Champlain and adjacent areas whose "bedded-lands" are producing up to 5 tons of bromegrass, alfalfa, and birdsfoot trefoil mixtures to the acre. The same kind of soil across the interceptor ditches do well to yield 1½ tons of poor grass.

More than 200 acres of clay and clay loam soils situated on the more level land, where outlets are at a premium, have been established on farms using the interceptor and surface ditch system in Clinton County since its start in 1957. Plans are to expand it in the "north country" rural area counties of New York State. Additional refinements, such as the use of the landplane or land leveler, are being made through research and actual use.

Rabideau grows corn for silage, oats, and forage crops consisting mostly of alfalfa, timothy, and birdsfoot trefoil on his 194-acre dairy farm east of Chazy. Back in 1958, when he first contacted the district about his excess water problem, he was growing only oats on this land—"and poor oats at that." He usually was late getting on the land, and in wet years couldn't get the oats harvested.

The Soil Conservation Service helped Rabideau establish the system, first surveying the area and making a contour map to determine the slope. A system of mains, interceptor, and conductor ditches was laid out to drain into a nearby line-ditch outletting into Lake Champlain.

10-acre "bed" of alfalfa, birdsfoot trefoil, and timothy on Philip Rabideau's (l.) farm. (R.)—Charles Woodruff of the SCS.

The interceptor and conductor ditches have an average depth of 2 and 3 feet with 8:1 side slopes, and the "beds" are 1½ feet from the crown to the channel of the surface ditch. Each "land" is 85 feet wide and between 800 and 1,000 feet long. The beds make it possible for Rabideau to grow grass forage mixtures on land that usually was too wet to grow anything but sedges and native grasses. It also is possible to grow an open-tilled crop, such as corn, in the first year of a rotation followed by a grain seeded to a forage crop.

A total of 6,800 feet of interceptor, conductor, and surface ditches were installed in the spring of 1958, and 13,280 feet built in 1959 completed the initial layout. The new "beds" were harrowed five times lengthwise and two times across, followed by final smoothing with a spring tooth harrow. Half of the construction costs were cost-shared through the Agricultural Conservation Program.

Rabideau planted Narragansett alfalfa, birdsfoot trefoil, and timothy on most of his 25 bedded acres, and has seen a slight increase in his hay yields each year since establishment in 1958. He claims his Narrangansett alfalfa did much better than the birdsfoot trefoil, and last year replanted some of his "beds" to Narragansett alfalfa and timothy. He uses an oats nurse crop the first year.

In the 1962 drought, when many Clinton County farmers were wondering what they were going to use for hay during the winter, Rabideau's alfalfa averaged 2 tons to the acre on the first cutting. Excess rain later, however, caused some lodging and other damage in

The author is work unit conservationist, Soil Conservation Service, Plattsburgh, N. Y.

his oats and forage crops.

His management includes applying 400 pounds of 8-16-16 fertilizer and liming at planting time, and topdressing every other year with 200 pounds of 0-15-30 per acre. He always goes into the winter with 6 to 8 inches of growth on his alfalfa, and some years with considerably more.

Rabideau has found that his "bedded land can be worked earlier than before," and that "cut hay dries quicker following a rain on land that has been terraced." His heavier soils are more friable, and the hardpan is broken to a point that roots go down deeper. Even the turned up subsoil seems to produce better, especially alfalfa. Rabideau likes this system of water management so well after about 6 years that he plans to extend it to his remaining 30 acres.

Rank growth of second cutting of alfalfa and timothy on bedded land.

Our Soil-Moisture Reservoir

By Cecil H. Wadleigh

ALTHOUGH most of the Nation's growing concern over its water resources is centered on lakes and reservoirs and underground aquifers the production of our basic needs such as food and fiber and wood products actually derives from the soil's capacity to supply water to meet evaporative demands on vegetated lands.

On an average day, water in the root zone amounts to about 650 million acre-feet. Thus, water held in the soil-moisture reservoirs at a given time is nearly equal to one-half the total annual flow of the Nation's streams—about 1,370 million acre-feet, or about 29 percent of average annual precipitation. Because about 3,380 million acre-feet of water—71 percent of our water budget—is used annually in evapotranspiration from fields, forests, and rangelands, the soil-moisture reservoirs must be recharged the equivalent of five or more times during the average year.

Management of soil-moisture reservoirs not only is a key determinant in the production of man's basic needs, but also is a significant determinant as to beneficial use of the major portion of the Nation's water budget. The soil acts as a sponge and retains water against the downward pull of gravity. This retained moisture enables plants to use water and grow between rains or irrigations, and to survive during protracted droughts.

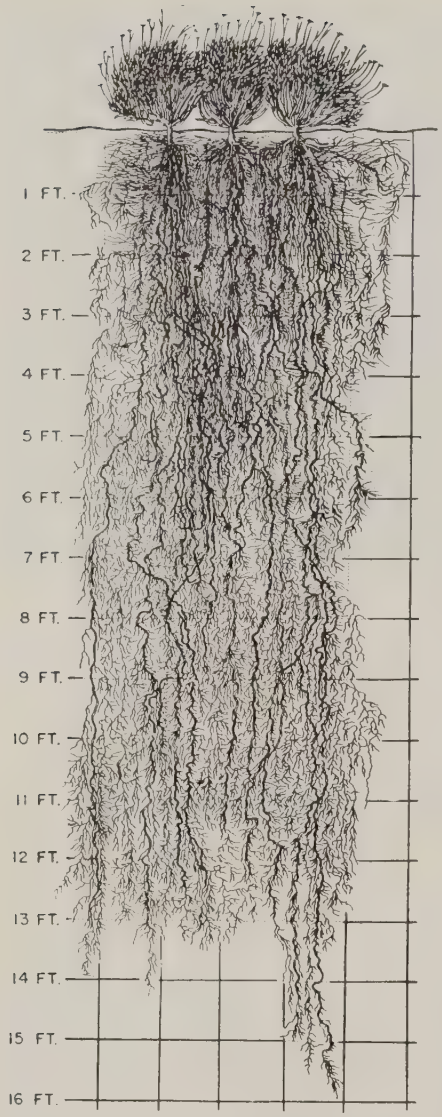
However, there is an important difference between a surface reservoir and the soil. Water in a conventional reservoir is free to run to the pump inlet and moves there more rapidly than the pump can extract it. Water in the soil is not completely free to move to the absorbing roots, and it may move much more slowly than the plant roots can remove it. Thus, use of the water in the soil-moisture reservoir is dependent on growth and proliferation, or multiplication, of the roots—the "pump"—to reach moisture films absorbed on the surface of soil particles.

The availability of the soil moisture is limited by the depth of the rooting zone and the supply of available water per foot of depth. A sandy soil may hold less than 1 inch of available water per foot of depth; whereas a clay loam may hold 2½ inches. Thus, a crop with roots penetrating but 1 foot in a sandy soil would have a moisture reservoir of only 1 inch of water;

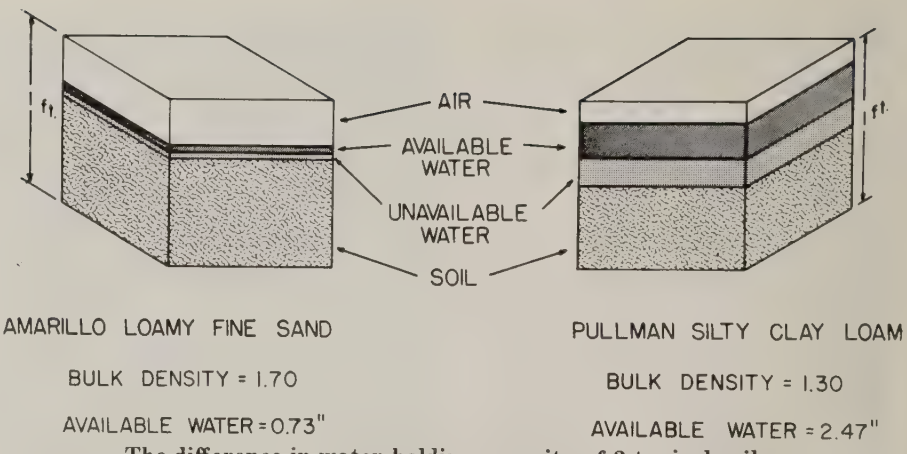
No. 72

This is the seventy-second of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

The author is director, Soil and Water Conservation Research Division, Agricultural Research Service, Beltsville, Md.



Root development of 2-year-old guayule plants that soil conditions permitted to penetrate deeply in Anthony loam near Litchfield Park, Ariz., with no evidence of adverse effects of drought because plants had soil-moisture reservoir of 18 in. of stored water.



The difference in water-holding capacity of 2 typical soils.

whereas a crop with roots penetrating 6 feet in a clay loam would have a reservoir of 15 inches.

On bright, summer days, solar energy will effect evapotranspiration of 0.2-0.35 inch of water per day. Hence, the capacity of the soil-moisture reservoir is a key factor in drought hazard and irrigation management.

The inherent nature of the crop plant has much to do with the characteristics of the root system. For example, alfalfa roots are capable of penetrating much deeper than those of Ladino clover. Roots of bermudagrass proliferate far more extensively than those of potatoes. Thus, the nature of the rooting behavior of crops may delimit the capacity and effectiveness of a soil-moisture reservoir.

There is little that can be done to alter the inherent water-holding capacity of a unit mass of a given soil. Puddling may decrease the proportion of larger pore spaces holding water at the lower tensions and thereby decrease the amount of available water. Significant increases in organic matter may increase water-holding capacity. There are numerous characteristics of soils which either inhibit or prohibit potential root development and thereby limit the moisture reservoir:

Shallow soils overlying bedrock or indurated layers have a correspondingly shallow soil-moisture reservoir. Similarly, when roots are stopped at plow depth by the plowpan, "traffic pan," or claypan, the potential moisture reservoir in the subsoil is unavailable.

On many soils of the Atlantic Coastal Plain, roots of most crops will not penetrate the subsoil, because its acidity may record a pH of 3.8-4.2. Associated with soil acidity, there may occur toxic levels of aluminum and manganese in the subsoil that prevent root growth. Evidence also indicates that roots cannot penetrate a medium that is completely deficient in boron or calcium.

Soluble salts in the soil mass frequently limit penetration and proliferation of roots in the irrigated valleys of arid regions. In some arid areas, excess salts may have been leached away in times past, leaving high levels of exchangeable sodium. A sodic soil attracts calcium avidly and may actually remove it from growing root tips.

Since roots are living entities, their degree of growth is dependent upon the prevailing temperature of the soil. The prevalence of permafrost in some Alaskan valleys provides an extreme example of conditions which adversely affect root penetration.

Roots of most land plants must have ample oxygen to grow, and even to absorb water; so good soil aeration is important in making the soil-moisture reservoir effective. Poor drainage curbs the development of root systems through lack of aeration, and in arid regions fosters the accumulation of salines in the surface soil.

All conservation farming practices which help the deep penetration and spreading of the roots of crop, range, and forest plants contribute to improved management and beneficial use of that enormous portion of the Nation's water budget that is used in evapotranspiration. It also is evident that practices which affect the important infiltration of water into our soils influence the rate of recharge of our soil-moisture reservoirs.

WINDBREAKS: Reduce Evaporation—Hold Snow—Lessen Wind Erosion

By Elmer L. Worthington

A VISIT to Leonard J. Davis' ranch in the Dunn County Soil Conservation District is enough to show why more and more tree windbreaks are being planted every year in North Dakota and other Great Plains States. As Davis—past president of the North Dakota Stockmen's Association and a State Representative—will tell you of the single row, pattern-type field windbreaks he prefers:

"I think they are the answer in our country for controlling wind erosion, holding snow cover, and reducing evaporation from the hot dry winds."

"I think one of the big benefits is for the community to do this," Davis said in recommending that others with suitable soil be encouraged to plant pattern-type field windbreaks. "The more concentrated the area, the more benefit these windbreaks are. Such community-wide growing of windbreaks also could conceivably eliminate the danger to livestock and humans from severe blizzards."

The Davises were the first in their vicinity to plant single-row, pattern-type windbreaks, which also have added to the beauty of the landscape. People who have seen their trees remark enthusiastically that others with soil suitable for trees should follow their lead. North Dakota farmers and ranchers, through their soil conservation districts, already are planting about 2,500 miles of these protective field tree belts each year, not including farmstead-type plantings. North Dakota leads the Great Plains States in the rate of total windbreak planting.

In addition to the rangeland, Davis' 1,440-acre cattle ranch on the east edge of the Killdeer Mountains includes 640 acres of cropland adjacent to the headquarters. He planted windbreaks on 3 quarter-sections of this cropland in 1958, and planted the other quarter-section in the spring of 1963.

He farms on the contour in 10- and 15-rod strips, with the windbreaks planted 30 rods apart. All the trees were planted after the contouring was established. Species used included green ash, American elm, Siberian elm, Russian olive, caragana, buffaloberry, aromatic sumac, and others. By the fall of 1962, the Siberian elm were 20 feet tall, and fruit for wildlife food also was being produced by the windbreaks.

In the Great Plains, young windbreaks must be well cultivated and kept free of moisture-competing weeds and grasses if the trees are to develop satisfactorily.

"It's a job," Davis said, "but not a big one at all. We cultivated our trees the first year just like we did our corn. I understand now that many people are using 'over-the-row' cultivation with special implements the first year or so. The second year the hired man and I took a hoe, and in a half-day we took out what weeds the cultivators had missed. We had about 6 miles of single-row belts at that time."

Here is Davis' observation on the

The Davises and County Agent Bill Cockburn in 1962 by Siberian elm windbreak planted in 1958.

Davis' single-row, pattern-type field windbreaks between contour crop strips.

The author is woodland conservationist, Soil Conservation Service, Bismarck, N. Dak.

effectiveness of the windbreaks in holding snow on the cropland as a source of soil moisture for the next season's crops:

"In April of 1961, we got a foot of snow with strong winds. The snow was held on our fields, but the others in the neighborhood where they had summerfallow had bare fields. We measured snowdrifts over 200 feet wide on the down-wind side of our windbreak, and I think that is the reason the crop was so much better in the windbreak area than anywhere else in 1961. I also doubt very much if the snowdrifts delay seeding, as the drifts are quite shallow and extend over a wide area on the leeward side of the windbreak."

Davis noted, among their benefits, that wildlife is beginning to use his windbreaks. He has observed several coveys of Hungarian partridge in the area, some nesting in the protecting tree rows.

He also calculates that the windbreaks protect a zone 20 times the height of the trees from soil blowing.

Utah Irrigated Area Profits From Modern Soil-Water Management

By Clifford L. Merrill and W. Bradford Hatch

Wells Robison on field that was given minimum tillage.

THE Delta area in Utah is a working example of the value of modern conservation practices to a rural community. More efficient irrigated crop production and increased farm income are among the benefits realized through operation of the Delta Soil Conservation District since it was organized by local farmers in 1949.

Although early settlers found an abundance of deep, rock-free soil, with favorable surface slopes for irrigation, they were confronted with problems that very nearly defeated them at the start. The soils were formed in Lake Bonneville and delta deposits from the Sevier River, Soil development was under near-desert conditions, with annual rainfall of only 8 inches. Normally the soils are somewhat salty, and the movement of air and water through them is slow.

The irrigation water likewise is salty. About 60,000 acres receive irrigation water in the Delta area. If sufficient water doesn't move through the soil, the salt content of the soil increases as the water evaporates or is used by plants.

Farmers have, of necessity, become especially responsive to management practices that help solve their problems of salt, soil compaction, and drainage. They have found, for example, that open drains are more effective than tile drains in heavy soil. They know that grazing crop aftermath will cause excessive soil compaction unless the soil is dry; therefore, grazing is kept to a minimum. They favor alfalfa seed crops in their rotation, because they generally require less irrigation water than other crops. They have learned that deep, infrequent irrigations in young alfalfa stands encourage deep rooting. Such plants can better survive drought periods.

One problem in particular has plagued Delta area farmers for many years: How could they keep the soil open to allow free movement of air and water? This problem was brought to the attention of the Soil Conservation Service

Alfalfa roots on either end are normal and indicate favorable soil conditions. Four short-branching roots in center resulted from conditions inhibiting deep rooting. Top growth was proportional.

The authors are retired soil conservationist and work unit conservationist, respectively, Soil Conservation Service, Delta, Utah.

Large, compact clods, slick surface, and numerous cracks show poor structure of field newly broken out of greasewood by Duane Stanworth, before conservation treatment.

technician assigned to the Delta district when it was formed.

Karl Harris, Agriculture Research Service engineer stationed in Arizona, was asked by SCS to study the problem and make recommendations. His suggestions were used by soil conservation district board members and a few other farmers on a trial basis in 1953, and since have been widely accepted, with notable success, by the farmers in the area. His recommendations included:

(1) Plowing the land deep to eliminate tillage pans, and thereafter plowing it at varying depths to avoid forming a compacted layer; (2) leaving the soil rough-plowed to air out for several months before irrigating or working the land; (3) using one heavy 12-inch, pre-planting irrigation to moisten the soil deep and to leach salts below the root zone; (4) avoiding use of the disk or similar implements, because of their pulverizing and compacting effects on the soil; and (5) keeping the seedbed preparation to a minimum, to avoid packing the soil.

Harris also proposed attaching several implements in tandem on the tractor to accomplish seeding, furrowing, and other operations with a minimum number of trips over the field.

Wells Robison, member of the Delta district board for many years, and a leading proponent of these operating rules, said he used more irrigation water by following them, but that his crop returns were greater than the increased water costs.

"I saved labor and equipment time during my busiest seasons," he added. "Salt content of the soil was reduced. When I plow the land now, it can be done one or two gears faster than previously, and the soil is less cloddy than before. Minimum tillage has resulted in soil improvement."

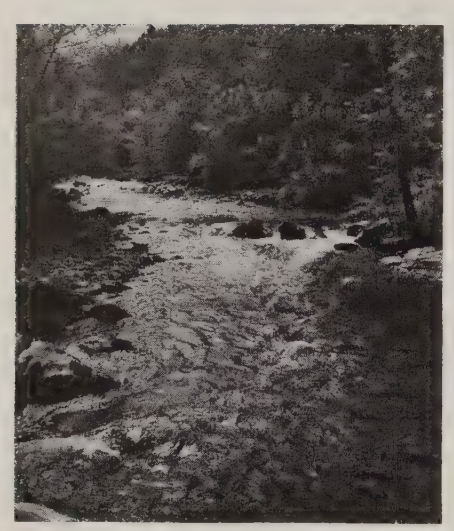
Delta district farmers have found that soil tilth also can be improved by planting grass. Although grass plants are slower in opening the soil—requiring 3 years or more as compared to 1 or 2 years by mechanical tillage practices in stubborn, heavy soils—their effects last longer, because of the root growth. The most practicable approach is to loosen soil deep by mechanical means, and then maintain good tilth by minimum tillage and by growing grass with legumes and incorporating the maximum amount of "crop litter" and barnyard manure into the soil.

Minimum tillage decreases farming costs and improves soil tilth and production efficiency at the same time. In soils with proper soil structure, plants root deeper, have darker green color with more uniform stands, require less frequent irrigations, and respond more favorably to fertilization.

Stanworth in good barley crop on same field, on which he used minimum tillage and applied crop litter and barnyard manure. Note baled hay for other feed in background.

Southeastern States Move Out On Surface–Ground Water Problems

By J. A. Johnson



SURFACE WATER. — Quality and quantity depend upon watershed protection.

IT took a major drought in the early 1950's to change the traditional attitude in the Southeast that water was a common enemy to today's continuing studies and actions by the States to encourage orderly development and wise use of their surface and ground-water resources in the public interest.

As water users placed greater demands upon surface and groundwater supplies, uncertainties developed in their minds with respect to legal rights in the development and use of water. A water-problems committee, or group, was formed in each of the 11 Southeastern States, including Arkansas and Louisiana on the west and Kentucky and Virginia on the north.

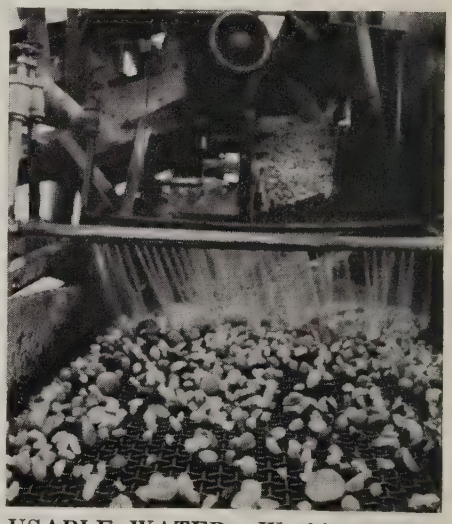
On the basis of preliminary studies, these committees recommended that water policies be declared by legislative enactment, and that further study be authorized leading to sound implementation of those policies to encourage and guide orderly development, wise use, conservation, and protection of water resources, and to provide greater protection for private and public investments.

By the end of the fifties, legislatures in nine of the States had declared water policies. In Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Virginia, policies covered both surface and ground waters. Declarations of Arkansas and Louisiana applied only to surface waters. Further study of policy needs and recommendations were authorized by the legislatures of Alabama and Mississippi.

GROUND WATER. — Conservation watershed treatment also helps keep artesian water flowing from deep in the ground.

Generally speaking, the policy principles were directed toward beneficial use, conservation of water supplies, encouragement of seasonal storage, and restrictions upon or discouragement of waste and unreasonable use, with attention to water-quality problems.

Declared policies of Arkansas, Kentucky, Mississippi, North Carolina, and Virginia were implemented in varying degrees with respect to surface waters. Policies of Florida and Georgia were implemented with regard to both surface and ground waters. And the 1963 Tennessee Legislature passed a water withdrawal registration act which applies to withdrawals above a specified magnitude from any water source, except those from public water systems by their customers. In most cases, implementation has included creation of a



USABLE WATER.—Washing gravel for highway building is one of uncounted uses for surface and ground water.

The author is water program needs specialist, Soil Conservation Service, Spartanburg, S. C.

State agency, or other arrangement to set water-use policy in motion and give it direction.

All of the States authorized further study of problems and needs, data collection, continuing recommendations, or a combination of these, as a function of the administrative agency, legislative commission, or committee or other body.

In addition to the declarations of policy, protection of water quality through pollution abatement has been carried on in the States, and there is increasing recognition of the need to protect ground-water quality. For example, the 1963 Tennessee Legislature also broadened jurisdiction of the Stream Pollution Control Board to include ground water. Problems resulting from saltwater intrusion are receiving attention in Florida and other coastal States.

A number of States have enacted well-driller licensing acts, and several have legislation to control wild-flowing wells.

Particularly with respect to ground waters, implementation of water-use policy is not a simple matter. For one thing, most States do not now have sufficient data for a full understanding of the occurrence, extent, and nature of their ground-water supplies.

Ground-water problems are not easily recognized. A dry, muddy, or polluted surface stream is an open document; whereas most ground-water problems must be viewed between the covers of a book. Also, the full significance of a known problem, such as a falling ground-water level, for example, may not be readily apparent. The effects of development of ground waters of some areas upon the surface supplies, or vice versa, have not been determined.

Study and data collection by the designated agencies, now under way in a number of States, will help to answer these and many other questions. Use-registration facts and data gleaned from well-driller reports also may be helpful. River basin investigations can be a source of valuable data, especially with respect to existing uses and future requirements. Other State and several Federal agencies, including the Soil Conservation Service, have some data which can help shed light on the occurrence, development, replenishment, or management aspects of underground supplies and upon present uses and future needs.

Thus, needed facts are accumulating upon which sound legislative adjustment can be based. As need and public understanding warrant, each State can further clarify and strengthen its water-use rights for underground as well as surface waters. Further clarification and strengthening of water laws may be expected as needs, problems, and public understanding dictate.

Minnesota Farmers Develop Water For Recreation and Wildlife

By Hans G. Uhlig

MINNESOTA farmers are becoming increasingly interested in recreation and wildlife as part of their farming business in rural community development. Many are asking for Soil Conservation Service technical help from the 82 soil and water conservation districts in the State in planning and installing wildlife improvement and other farm and watershed undertakings.

Records show, for example, that more than 3,000 acres were improved for wildlife during 1962 alone. In addition, farmers built 1,300 stockwater pits and ponds, bringing the total built in recent years to well over 7,000. These areas are of value to waterfowl and for related recreational purposes.

As an example, a total of 112 ducks were observed on 14 pits in the Wright Soil Conservation District during 7 observations in the spring of 1962. Five broods—30 ducklings—were produced on these pits. Pheasants, shore-birds, and deer also make use of the areas.

Amer Froysland, cooperator with the Becker Soil and Water Conservation District, is an avid sportsman. However, his interest includes development of wildlife areas as well as hunting and trapping. With planning and survey assistance from the SCS and cost-sharing from the Agricultural Conservation Program, Froysland has built two dams and is considering another. The author has counted 200 ducks making springtime use

The author is biologist, Soil Conservation Service, St. Paul, Minn.

Samuel Gilbert's farm pond with 8-acre wildlife area planted around it in Pipestone SCD.

Wild ducks on typical water conservation and recreation pond.

of Froysland's 25-acre wildlife area.

A rehabilitated slough on the Harry Jagow farm in Swift County is turning out to be a real wildlife-producing area. In 1959, Jagow dug a stockwatering pit, using the excavated material to dike a 4-acre slough and to build three islands. The first year, 3 pairs of blue-winged teal stayed and raised their broods. The second year, he had 7 pairs and last year 20 pairs. In addition to the ducks, the slough is being used by pheasants, mourning doves, and other wildlife.

"Wildlife use my stockwater pit almost as much as my horses and cattle do," Edward Haglund, a Koochiching district cooperator, says of the nesting mallard ducks.

Deer and many smaller wild animals also use the pit.

Users of Minnesota lakes likewise benefit from conservation planning and developments. Thus a lakeshore owner and a farmer worked together in solving gully erosion and a silting problem on Sugar Lake, northeast of Annandale. Lawrence Carlson and John Topfer asked help from the Wright County SCS Work Unit and installed a pipe drop inlet and two grass waterways. Topfer used the fill for a road for his farm operation, and Carlson uses it to reach his lakeshore property. Both recommend that more farmers and lakeshore owners work together dealing with such problems around recreationally important lakes.

"My detention dam serves many purposes," says Alfred Rucker of Oronoco of a structure planned with SCS technical help from Rochester. "It stopped the gully, reduced flood damages, and, with the surrounding area fenced out, it will make an excellent haven for all kinds of wildlife. In addition to this, in the winter it provides the community with a safe skating rink for recreation."

Tired of fighting a gully on his Waseca County farm, Cletus Hoehn put in a dam with a spillway and turned the gully into a stockwater and fish pond with about an acre of water surface. Hoehn and his neighbors now take bluegills weighing up to ¾ pound, and bass weighing 2 pounds or more from the pond.

The farm pond on the Orlan Mack farm in Brown County had a new use when Mack's relatives and friends gathered to hunt ducks. Shortly before the season opened, some 85 wild ducks were counted on the SCS-designed pond.

These examples of farmer participation in the wildlife and recreation movement point to the potential proportions of such developments in the future. There now are more than 45,000 soil conservation district cooperators in Minnesota, who control 10 million acres of farmland.

Steel Barrel Risers Cut Cost of Underground Irrigation System

By Leon R. Hubbard

RANCHER John Carpenter of Steptoe Valley in Nevada used a new "barrel" riser technique to save costs of an underground irrigation system that solves a tough water problem and doubles his hay output.

Making the best use of irrigation water is not a new problem for Carpenter and other cooperators of the White Pine Soil Conservation District. These lands are, in some cases, steeply sloping, with light textured, erosive soils.

"For many years," Carpenter says, "we used open ditches to bring water from a big spring to corrugated fields. These ditches didn't work very well, and we lost a lot of water and soil. It also took a lot of time to operate and maintain them.

"We got better use of our water when we installed a mile and a half of pipeline to get water from the spring to the edge of the fields, but we still lacked the kind of efficient water distribution we were after on the fields themselves. The answer was to install another underground pipeline, with risers that would get water onto each field with less waste and erosion.

"One day we talked things over on the ranch and came up with the idea of using 50-gallon barrels for risers. Risers could give better control of irrigation water and make water run more evenly over the fields; and the barrels, being cheaper than concrete, would hold down the cost of the new distribution system. When it came to designing the risers, though, we were getting over our heads; and we called on technicians of the Ely office of the Soil Conservation Service for a hand. We worked out a riser system that paid off from the start."

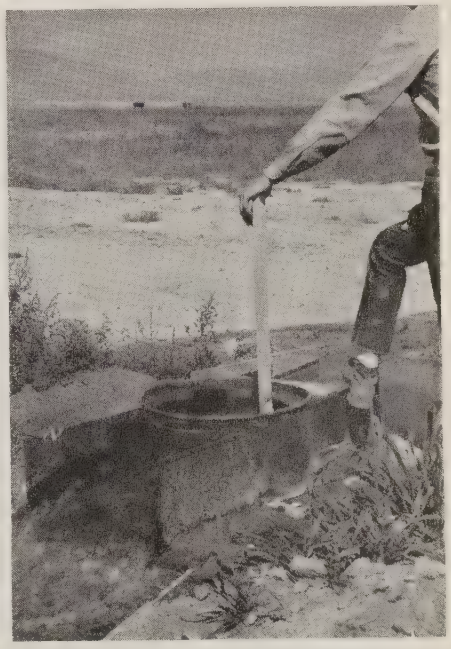
The author is work unit conservationist, Soil Conservation Service, Ely, Nev.

Carpenter first dug a 2-foot deep trench, 1,540 feet long, through the middle of his irrigated fields for a new underground pipeline. The trench was deep enough to permit the new pipeline and riser system to discharge the water from riser outlets at ground level. He has more than 40 feet of fall to work with in his pipe and riser system. Risers serve as a drop structure and outlet box, doing the same job as concrete drop structures.

Five 34-inch, 50-gallon steel barrels were made into risers. Eight-inch inlet and outlet holes were cut on opposite sides of each drum. Next, 15-inch squares were cut out of the top of each drum, and outlet gates were welded to it at right angles to the pipeline. Pipe and risers were coated with asphalt preservative to prevent rust.

Welding pipeline joints together, and the riser boxes to the pipeline, gave Carpenter a solidly built pipe system. The pipeline and barrel-

Carpenter stands beside old discharge pipe that fed water into open ditch at about 900 gallons a minute, with new barrel riser ready to be installed.



One of Carpenter's barrel risers in operation.

type risers eliminated a serious erosion hazard that existed with the old open ditch system. Cost of maintaining the risers and pipeline is low. The former open ditch area now can be farmed; and with the new riser-pipeline system, Carpenter can regulate his irrigation runs and get full use and better control of water.

The pipe and riser system cost about $1,200, with the Agricultural Conservation Program shouldering about half of the expense. Carpenter figures the investment has more than paid off, because of a large saving in water and maintenance cost. Three-fourths of the installation cost was saved by this ingenious use of barrel risers in place of the ordinary concrete risers.

Seepy-Pastures Springs

Pay Off For Ohio Farmers

By Adrian Achtermann

HOLMES County Soil and Water Conservation District farmers in Ohio are developing 40 springs a year to provide fresh water for livestock and transform rundown seepy areas to profitable pastures.

Four hundred seepy areas in the rolling countryside of the county have been developed to date. To expedite the practice, the district bought tank forms late in 1953 and are renting them to farmers.

Once rundown fields short on water have been renovated to provide succulent forage for cattle, because seepy areas have been developed to provide the water. These fields again are paying their way.

For the county as a whole, a total of 220,000 gallons a day of fresh water is available from the 400 spring developments, and may be credited with an estimated $96,000 increased income. Similar results can be obtained where beef cattle use spring water in fields isolated from the farm buildings and at one time of little value for pasture, because of their lack of water. Where springs can be developed in these fields, they are seeded to provide usable pasture.

Such a spring development can be expected to last 15 years. The increased return per spring, above the cost of construction, which averages about $250 over its lifetime, is figured at $3,600.

The first of these spring developments in Holmes County was on the farm of Frank Shutt, who has served as a member of the district board of supervisors for 15 years. The spring, developed in the fall of 1953, has provided a reliable source of water for Shutt's 30 cows.

FIRST.—Shutt's fenceline spring was developed 11 years ago.

"I saw the need for spring developments and urged the district to buy tank forms," Shutt reported. "My cows have been drinking fresh water for 10 years."

Shutt developed a little wet area that has provided an average daily supply of 550 gallons of water.

Floyd Jones, another Holmes County district supervisor, for 10 years, has installed six developments in different fields.

"Without water, these fields were useless during July, August, and September," he said. "Now, with a good fertilization program and the constant and fresh supply of water, I can pasture about a cow to each 1½ acres throughout the summer. This has greatly increased the size of my milk check."

Moses Hostetler recently installed the district's 400th spring devel-

ONE OF 6.—They have increased Jones' milk check.

The author is work unit conservationist, Soil Conservation Service, Millersburg, Ohio.

opment on his farm. A 15-acre field had been virtually abandoned by the previous owner. Realizing that a seepy area could be developed to provide water for livestock, Hostetler asked the Soil Conservation Service for help. Now that he has a reliable supply of water, he is reseeding the rundown pasture.

Rundown pastures, far from the buildings with no water, present a common problem in Holmes County, but it also has an abundance of these underground reservoirs of water. The Conservation Needs Inventory showed that about 40 percent of the springs had been developed for livestock water, and that there is a potential of nearly 330,000 gallons of additional water available from underground seeps. Development of this replenishing supply accordingly can yield an additional income of nearly $150,000 annually. The resulting renovation of pastures will produce an even greater return.

"Moisture Accounting" Method For Irrigation Tobacco Growers

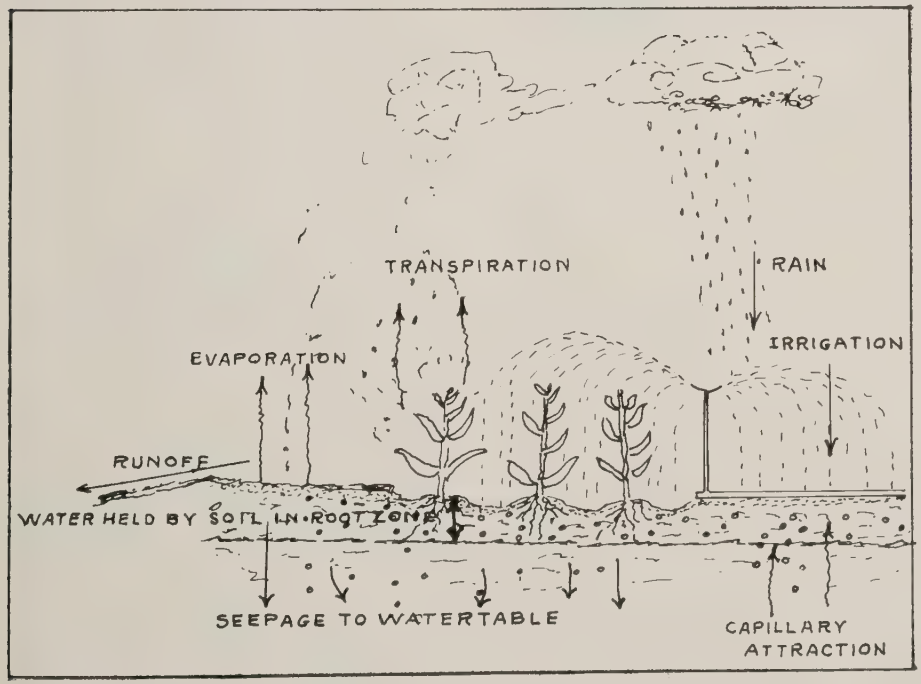
By Sam Cole

A "moisture accounting" method for determining when and how much to irrigate has been developed by the Soil Conservation Service working with Virginia tobacco farmers who began to supplement rainfall with irrigation about a dozen years ago.

Whether natural or artificially applied, water needs to be received in the soil before the moisture available to plants in the root zone is exhausted. The moisture accounting method shows what that moisture balance is and provides the irrigator with a guide as to when and how much to irrigate.

Checks with those using the new moisture accounting technique have shown that the quantity of water it indicates should be used is much more exact than the general recommendation, for example, of "light and frequent irrigation for tobacco," and that only a day or two have separated the "balance" method from the "judgment" method used by most. It generally has been found that when the moisture accounting record book shows a "zero balance"—or less than 1 day's supply of "available" water—the irrigator had applied water or was consulting weather forecasts and gathering other information by which to irrigate.

Charlotte County Farmer and SCS Work Unit Conservationist Norman Ramsey logs temperature with maximum-minimum (top) and conventional thermometers for evaluating daily moisture evaporation from tobacco land.



This chart illustrates why all rain or applied water is not available to plants. Irrigation should restore water in root zone to field capacity.

Customers and neighbors of W. A. Ellen at his crossroads store in Amelia County use his record book as a "book of facts." Allen himself says: "It's remarkable how my judgment and the figures agree. But it's a fact that it has sharpened my judgment about irrigation."

This is how the moisture accounting method for scheduling irrigation works:

All the equipment needed is a rain gage, a maximum-minimum thermometer (if daily average temperature information from a nearby weather station is not available), and the record book. The irrigator records average daily temperatures, the amount of rainfall or irrigation water applied, if

The author is engineer, Soil Conservation Service, Chase City, Va.

Irrigating bright tobacco on Foster Reynolds farm in Southside SCD.

Howard Hamlet (l.) and SCS Engineer Gail Ely in irrigated bright tobacco in Southside SCD, Mecklenburg Co., Va.

any, and an estimate of full sunshine for the area in increments of 0, 5, 9, 12, 15 hours each day.

The SCS technician measures the moisture content of the soil when it is at field capacity in the root zone; that is, when the soil contains in the voids all the water it can hold against the pull of gravity. Root zone depth of tobacco is considered to be 8 inches until it is about 3 weeks old, then 14 inches until the plant reaches maturity.

All of this water is not available to the plant, because surface tension on the soil particles will not release it completely. The plant never should reach the wilting point, as at this point the crop may suffer permanent damage. Therefore, the "available moisture" (approximately 50 percent of field capacity) is entered into the record book as the initial "deposit." This deposit is made 2 or 3 days after a soaking rainfall or an irrigation designed to wet the soil to field capacity.

Only measurable rainfall and irrigation are recorded as "deposits." Rainfall in excess of the amount to establish field capacity is considered lost, and dew and water rising from lower strata to the root zone by capillary action insignificant.

"Withdrawals" from the moisture account are made by consulting the "evapotranspiration chart." The irrigator, using this chart as a guide and, interpolating where necessary, estimates the daily consumptive use of the plant, computed by the Blaney-Criddle formula for tobacco at latitude 37°-03′. He subtracts this figure from the preceding day's balance and determines available water on hand. When the balance shows zero or insufficient quantity to carry through another day, he should irrigate.

Conservation Farm Pond Water Is Used To Fight Mill Fire

By H. H. Odell

CONSERVATION farm ponds and small-watershed impoundments have in recent years become increasingly important sources of water for fighting fires in rural areas. The experience of one community, in Edgefield County, S. C., earlier this year is a reminder during Fire Prevention Week, October 6-12, of the further importance of having such water supplies available in agricultural areas which include industrial or other developments of community-wide benefit.

Conservation farmers teamed up with South Carolina National Guard forces and others in making agricultural water and equipment available when the public water supply was exhausted in the early stages of a multi-million dollar textile mill fire last January 26 near Johnston in the Savannah Valley Soil Conservation District.

When the regular water supply

The author is work unit conservationist, Soil Conservation Service, Edgefield, S. C.

was depleted by the mill's automatic sprinkler system, they turned to a 3-acre conservation farm pond a third of a mile away built several years ago by Rene Herlong. A National Guard bulldozer operated by Dewey Padgett of Edgefield threw up a temporary earth dam across the paved driveway into the

Top.—Textile mill that was on fire. L.—Farm pond that supplied water to put it out. R.—Irrigation pump Fred Holmes and brother lent firefighters. Bot. — Emergency reservoir being leveled after the fire.

plant. From here the fire trucks were able to pump the relayed water onto the flames and smoldering material in the building.

District Cooperators J. C. and Fred Holmes put the pump and some of the 8-inch portable main of their Soil Conservation Service-designed farm irrigation system to work keeping the temporary reservoir at the mill filled until the fire was extinguished. Another cooperator, Frank Berry, also provided some of the fittings from his nearby sprinkler system. Other farmers cooperated by supplying labor crews for around-the-clock cleanup activities, enabling the mill to resume partial production on

January 30, and full production 1 week after the fire.

Plant Manager T. J. Meyer and Mayor E. Forrest Edwards of Johnston joined in crediting the community cooperation and the local soil and water conservation program for the major part they played in this emergency in Edgefield County's ridge section.

SOIL CONSERVATION IN INDIA. By M. S. V. Rama Rao. 1962. Indian Council of Agricultural Research. New Delhi. Rs 10.00.

My good friend M. S. V. Rama Rao, formerly engineer director of Soil Conservation in India, has written the first book on soil conservation to be written and published in India. I was especially interested in reviewing this book, not only because of my visit to India in 1960 but, also, because Rama Rao and I had many interesting discussions during some 3 weeks of field travel together and subsequent conferences.

Many of the projects cited in the book and situations described were observed by me in India. Therefore, I can vouch for the basic accurracy of the contents.

The book aims to provide all the essential information on the nature and causes of soil erosion, the necessity of soil conservation, principles and techniques of saving the soil and maintaining its productive capacity, and the part played by sciences like agronomy, forestry, hydrology, range management, etc., in controlling erosion.

As would be expected of an engineer, Rama Rao has given especial emphasis to the engineering phases of soil conservation. However, he has properly emphasized the necessity for biological methods of erosion control.

"Soil Conservation in India" is something of a mixture of the citation of problems and projects together with some rather detailed specifications for such engineering measures as bunds (terraces), gully control structures, etc. The citation of the problems and projects

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will have general educational value in India while the details will be helpful to agricultural workers.

Brief reference is made in the book to soil surveys and land capability classification as used in India. The principles developed in the United States for soil surveys have been adopted in large degree in India. Likewise, the basic concepts of soil conservation proven successful in the U.S. are proving successful in India. Of necessity, due to varying soil, climatic, economic, and social condition, there have been many adaptations to local conditions. But the concepts are still sound.

It must be realized that India has meager research and experience in dealing with many of its conservation problems. Therefore, it is gratifying that techniques developed in the U. S. are finding practical application in India. This has resulted from a variety of impacts.

Many Indian soil conservationists have visited and studied in America; soil conservationists from the Soil Conservation Service have served as technical advisers in India; and there has been a great deal of supplying of technical publications and handbooks.

In writing "Soil Conservation India," Rama Rao has made a very great contribution to his country.

—Donald A. Williams

REPORT ON THE LANDS OF THE ARID REGION OF THE UNITED STATES. By John Wesley Powell. Edited by Wallace Stegner. 202 pp. 1962. The Belnap Press of Harvard University Press. Mass. $5.00.

Conservationists will find provocative reading in this publication first printed in 1878 but long out of print and available largely in public libraries. Edited by Dr. Wallace Stegner, professor of English at Stanford University, the book is presented in attractive format, with maps. The editor has added much instructive material in his introduction and footnotes.

Even with generalized scientific information, Powell interpreted the needs for western land settlement with a clairvoyance that has proved prophetic. Had his ideas been carried out, many of the disasters that occurred west of the 100th meridian could have been avoided.

He foresaw the risk of superimposing a subhumid eastern land settlement program in the arid West where drought is normal and where abundant rainfall is unusual. He recommended 80-acre homesteads for irrigated land, and more than 2,200 acres for grazing homesteads. He stormed the citadels of entrenched competitors by recommending the revision of the 160-acre homestead law, modification of the rectangular surveys in arid lands, reform of the General Land Office, transfer of the cadastral surveys to the Coast and Geodetic Survey, elimination of all contract surveying, and consolidation of the geological and geographical surveys of the West into one bureau under the Department of the Interior.

These revolutionary proposals received the same immature treatment too often given cold facts and logic. The western congressional block, cattlemen, and offended bureaucrats united against the recommendations. And Powell, eliminated by his own plans, was shifted over to the Smithsonian Institution. But he stubbornly continued his campaign for factual and scientific appraisal of western land settlement and development needs. He went on linking headwaters and lower waters, watershed and bottom land. And his ideas, largely ignored at that time, have become incorporated in much of modern conservation legislation.

This report also presents a classification of lands and vegetation in the various river basins in Utah. More than 80 years ago, Powell and a party estimated that only a little more than 2 percent of Utah's lands could be irrigated or dry farmed—a projection which was proved to be true.

—B. W. Allred

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Soil Conservation

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Soil and water conservation contributes directly to the increasing efficiency with which United States farmers are producing food and fiber and wood crops for 190 million citizens and for world outlets.

The vital importance of their being able to supply today's and future demands, in the amounts needed when they are needed, is pointed up by the fact that while the Nation's urban population has increased to 70 percent, farm population has dropped to only about 7½ percent of the total. Of the 3,134 counties in the United States, only 361 are in metropolitan areas, but the Nation's total population growth in the 1950's occurred in those counties.

The percentage of people actually producing farm commodities is still lower than farm-population figures indicate, because of part-time and other urban workers' living on land units classified in the census as "farms." One farmer today produces the food for himself and 28 other people. In 1940, when conservation land planning and treatment was being speeded up through farmers' and ranchers' still-new soil conservation districts, each farmer produced for himself and 10 others. At that time, 23 percent of the people in the United States were classified as farm population.

COVER PICTURE.—Town and country meet in the best American tradition here at the conservation-treated farm of B. J. Conklin on the western edge of Templeton, Iowa. The November photograph shows how parallel level terraces have helped control erosion on this Carroll County land.—Photo by E. W. Cole.

VOL. XXIX, NO. 4 NOVEMBER 1963

CONTENTS

Page

75 Soil Surveys Are Guides for Urban-Area Developments
By R. M. Marshall

78 City and County Plan Ahead To Meet Problems
By Remo Molinaroli

80 Urbanization Spurs Citrus Land Shifts—Conservation
By Alex Franklin and Bob Richardson

82 Farmland Is Converted To City People's Playground
By Walter H. Dove

84 Land—Water—People
By Donald A. Williams

85 "Let Us Vote for Grass and Water"
By Orville L. Freeman

86 Farm Family Scores Par in Converting To Golf Course
By J. Dale Schott

88 Farm-City Teamwork Boosts Rural Area's Economy
By Gordon S. Smith

90 Watershed Project Ups Farmers' Income—Town's Economy
By Bernhard A. Roth

92 Farmers Profit When St. Louisians "Go Fishing for Fun"
By Howard C. Jackson

93 Bobwhites Draw City Hunters To Conservation Farm
By R. Hoke Smith

94 Fun for 100 Families in Conservation Farmer's Woodland
By Lester Fox

96 Women See Where Food Comes From
By Mrs. James Nauss

Soil Conservation

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FRANK B. HARPER, Editor

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Soil Surveys Are Guides for Many Urban-Area Developments

By R. M. Marshall

URBAN area planners the country over are following the example set years before by their farmer neighbors and are using soil surveys to help them plan the most efficient use of their shrinking and already overburdened lands.

A continuing shift from a once predominantly rural land occupancy to an increasing urban concentration among the 190 million people in the United States involves the conversion of about 1 million acres a year of agricultural land to suburban housing, industrial developments, highways and airfields, recreational areas, and other nonagricultural uses. In the many times unplanned, uncontrolled growth of our towns and cities—referred to variously as "urban sprawl," "megalopolis," "suburbia," "rurbanization," or other designations—often the best agricultural land is the first to be covered with concrete. Sand and gravel deposits needed for future construction also often are lost to use.

Homeowners, developers, taxpayers, and local governments all may suffer costly damages—new homes flooded, cracked walls and wet basements, inoperative septic tank systems, deterioration of streets and highways from soil expansion and contraction, severe erosion on unprotected sloping areas, overtaxed water-disposal systems, sediment-clogged sewers, silted reservoirs, and contaminated well water supplies. Soil surveys have helped avoid some of this extensive damage.

The soil and water conservation problems resulting from such land dislocations can be dealt with only if soils and other available technical information is used by all concerned—from urban and rural planning authorities and developers to contractors and builders.

Response of city and other local groups to this need has led to their cost-sharing with the Soil Conservation Service for making standard soil surveys, generally through a 50-50 arrangement. The local group generally bears all the costs for additional information and data not normally collected in soil surveys of agricultural land—such as depth to bedrock, resistance measurements of the soils for use in corrosion engineering, and laboratory determinations of their shrink-swell potential.

Some local groups are using part of the money granted them by the Urban Renewal Administration of the Housing and Home Finance Agency for urban planning to cost-share the making of soil maps and the development of predictions about soil uses in urban-fringe areas. Some groups are requesting general soil maps which only show major kinds of soils in general soil groupings. These general maps are not suitable for detailed, or operational, planning purposes, but are sufficiently detailed to outline large soil areas of questionable suitability for septic tank sewage disposal systems or for adequate foundations for structures and areas subject to flooding.

HHFA grant money is also being used for cost-sharing detailed or operational soil surveys and reports when the area lies in the path of urban development. The SCS has set up a long-term schedule to complete detailed soil surveys for the entire United States. Local governments and planning authorities obtain a priority in the schedule by contributing to the survey's cost. The HHFA 701 grant money used in soil surveys is limited to the amount of the locality's contribution to the SCS.

The SCS in May 1963 entered into an agreement with the South-

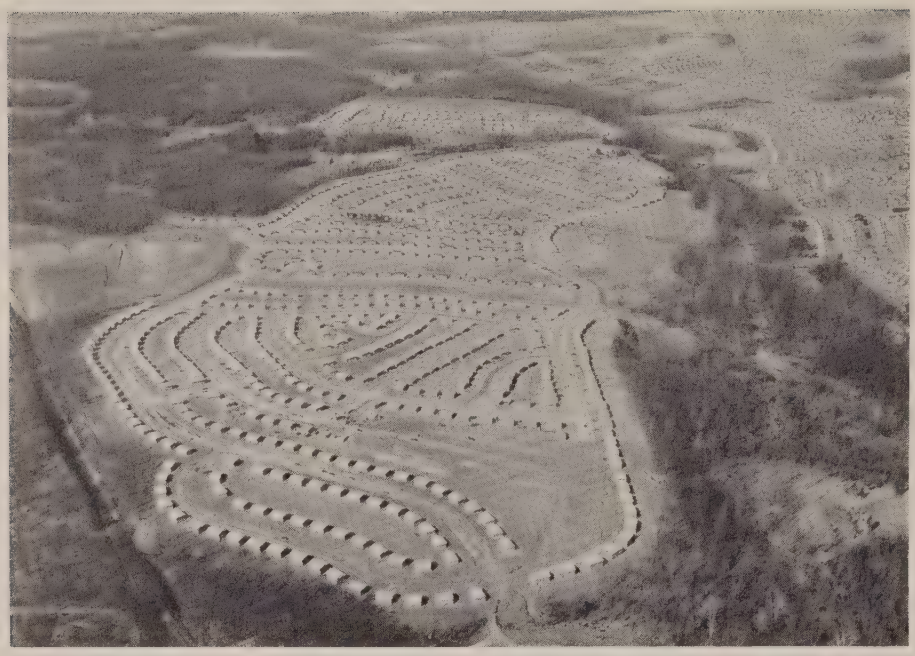
Soil and water conservation district farmers and conservation workers throughout the Nation again will be among those joining their town neighbors in this year's annual Farm-City Week observances from November 22 to 28.

Land and water resource conservation has received increased emphasis each year, both during this annual week and in the year-around activities of national, State, and local Farm-City Committees coordinated by Kiwanis International.

The importance of teamwork in conservation planning and action has been reflected, meanwhile, in the multiplying numbers of community small-watershed protection and flood prevention projects, usually cosponsored by the farmer districts and local business and other interests in benefiting towns or cities. Rural areas development, recreational, and other newer improvement and development undertakings in agricultural sections of the country all depend upon the closest farm-city cooperation for their effectiveness.

More than 10,000 United States and Canadian communities participated in 1962 in Farm-City Week programs designed to build better understanding between rural and urban neighbors.

The author is assistant director, soil survey operations, Soil Conservation Service, Washington, D.C.



Suburbia on the move is shown in this view in Montgomery County, Md.

eastern Wisconsin Regional Planning Commission to make soil surveys for use in planning a 6-county area (Washington, Ozaukee, Milawaukee, Racine, Kenosha, and Walworth) in 3 years. SCS will receive $139,000 for this survey. An agreement also has been signed with the Northern Kentucky Area Planning Commission to provide soil maps and predictions for the Greater Cincinnati Area. SCS will receive $5,000 for these.

Additional money is being contributed to the cooperative soil survey by State appropriations in a few States, and by soil conservation district governing bodies, local planning and other groups.

Ela Township in Lake County, Ill., was one of the first in the country to cost-share soil surveys. Lake County is providing $20,000 for the survey during the next 4 years.

Work with the Monroe County Soil Conservation District in New York is accelerating a standard soil survey there, and a soil survey was made of a park area in the Huron-Clinton metropolitan area.

On June 5, 1963, the last acre of the soil survey of Montgomery County, Pa., was mapped, with a special ceremony. The county put up $30,000, over 3 years to accelerate the survey. The State also contributed $10,000. The county planning officials used preliminary soils information and maps as the work progressed, to locate areas suitable for residential, industrial, and municipal development.

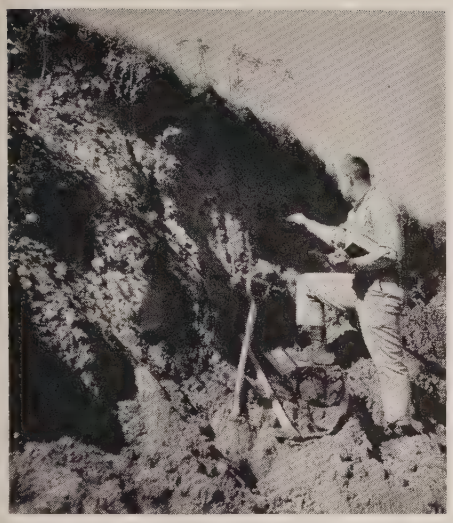
Hanover Town, Mass., along with the towns of Acton, Whitman, Avon, Sudbury, Greenfield, and Dracut, have entered into cost-share arrangements with the SCS for soil surveys to be used for urban planning. The Massachusetts Department of Commerce is publishing the Hanover Town survey. In some cases, consulting firms are cost-sharing the surveys, in order to have base soil data for planning in some of these towns.

Connecticut is approaching the problem of overall town planning in towns like Hartford, Danbury, and Stamford by providing general soil maps (land resource unit maps), with interpretive data, to guide making a layout for housing, industry, schools, shopping centers, and roads.

Virginia was one of the States which began several years ago to use cost-shared soil maps and predictions for planning in urban areas. Fairfax County was probably the first county in the United States to employ its own soil scientist to interpret the maps and help landowners. Cost-sharing in soil surveys has spread to Henrico, Augusta, Chesterfield, Orange and other counties.

James Island in South Carolina has a new soil survey and report entitled, "Soil Resources for an Expanding Population." The survey was made at the request of the Charleston County Soil Conserva-

In highway construction like this at Richmond, Va., soil has to be drained, graded, and protected from rainfall and frost for roadbeds and bridges.



Soil surveyors like this one on the job near Litchfield, Conn., check exposed banks and cuts to learn about soil suitability for building or other use.

tion District, which paid the $2,500 printing costs.

Other States that have been using soil surveys in urban planning include New Jersey, Michigan, Texas, Missouri, California, and Oklahoma. Santa Clara County, Calif., for example, adopted ordinances excluding subdivisions, factories, and stores in the agricultural zone it established.

Even where agriculture is not an important alternative land use within the urban fringe, essentially the same soil classification is needed for predictions about housing, industrial development, sanitation, drainage, parks, pipelines, and road and street construction. Oftentimes, even greater mapping detail is necessary in delineating areas of different soils in urban-fringe areas than on agricultural lands. Special emphasis is given to the engineering properties of soils that influence their suitability as subgrades and foundations.

Depth of soil to rock is important in building or other construction, and in laying out utility pipelines to avoid bedrock and other restrictive layers. The information on soil depth alone has saved contractors and cities more than the cost of the surveys in some cases.

Soil surveys save urban property owners and local governments substantial sums in other ways. One is by determining soil drainage characteristics so builders may avoid, for example, soils that are periodically flooded and consequently are not economically suitable for housing or industrial development but should be left in agricultural or recreational use.

Slope is another important feature in the urban-area soil survey, because special care is needed in laying out a development to avoid leaving the soil bare and exposed to rains and subsequent erosion damages. The runoff that has to be handled in urban areas is much greater than on land in vegetation,

Oil and gas companies need to know about soil before laying pipelines such as this one going in near Lincoln, Nebr.

because rooftops, streets, parking areas, and the like produce virtually 100 percent runoff.

Because they provide dependable information on these and other aspects of urban-area land capabilities, the soil maps and soil predictions provide a basis for orderly progress in urban-fringe areas instead of hit-or-miss "urban sprawl." The technical data become practical guides that provide the "city fathers" with a scientific basis for decisions in urban development—from office buildings to golf courses—and thereby help assure more stable and rewarding land use in urban-fringe areas.

CUTTING DOWN EROSION AND SILT DURING SUBURBAN CONSTRUCTION

More care and better planning to cut down on silt fed into streams during large-scale suburban construction are advised by Agricultural Research Service specialists. Recommendations for control of such silting, which can run as high as 121,000 tons a square mile, have been developed by Donald E. Whelan, hydraulic engineer, and Clarence S. Britt, soil scientist.

Reporting at the 1963 annual meeting of the Soil Conservation Society of America, Whelan said silt control programs should be planned ahead for entire watersheds that are to become urban areas. Procedures successfully used in protecting farmland should be followed, but research is needed on special urbanization erosion hazards. The cost of erosion control should be considered in the total cost of urban development.

Whelan cited results of sedimentation surveys near Washington, D.C., by the Geological Survey and the Soil Conservation Service. One found an estimated 3,880 tons of sediment eroded from a 20.5-acre site during the 18-month construction period of a mass-housing project near Kensington, Md. And urbanization of the Lake Barcroft watershed in Fairfax County, Va., between 1942 and 1957 produced 25,000 tons of sediment in the reservoir for each square mile of residences.

City and County Plan Ahead To Meet Urbanization Problems

By Remo Molinaroli

A specially prepared soil survey and drainage plan is being put into use by local officials in the Charleston area to help them cope with multiplying land-use and water-management problems arising from rapid urbanization in this South Carolina coastal vicinity.

Rapid population growth in central Charleston County has forced urban development onto poorly drained lands unsuited to homes or industry. Rurban areas already extend far beyond the relatively high peninsula between the Ashley and Cooper rivers on which the historic port city was founded, and beyond the present city limits.

Within 10 years, urban developments are expected to occupy the central one-third of the county, which stretches 90 miles along the coast and up to 15 miles inland. County planners estimate that another third of the county will be urbanized within 30 years.

"Before 1955, the metropolitan area grew without guidance or control," said J. Mitchell Graham, chairman of the Charleston County Council. "Before 1963 the installation of water-control measures in built-up areas was haphazard, the result of expediency. Drainage was designed to serve an immediate purpose, without regard to future developments."

As a result, water stood around many homes in wet seasons. Septic tanks didn't work, because of high water tables in the soil. There was flooding when spring tides coincided with heavy rainfall. Many residential subdivisions became slum areas before their time.

The author was formerly engineer, Soil Conservation Service, Charleston, S. C.

Subdivision regulations, adopted in 1955, were strengthened in 1961. County government and the Charleston County Soil Conservation District proposed that the drainage problem receive top priority action. The proposal was supported by businessmen, industry, landowners, and the Department of Defense, which has many installations in and near Charleston.

Soil survey agreement being completed by Charleston County Council Chairman Graham (signing), SCS State Conservationist T. S. Buie (l.), and SCD Chairman T. Wilbur Thornhill.

The county was tentatively zoned for development, and on this basis criteria were established for a drainage feasability study. The greatest degree of protection would be provided the coming urban areas. Truck crops ranked second, followed by general field crops, and then by trees.

The agricultural land, largely devoted to vegetable growing, is the best-protected nonurban area, because of canals established years ago by the Works Progress Administration and, more recently, through assistance from the Soil Conservation Service and the County Public Works Department. But because urban growth threatens the truck farms, farmers also have supported strong action to solve the county's drainage problems.

Support was not lacking, but money was. Then the soil conservation district and the county council each appropriated $15,000 for a study of drainage needs, the development of an overall plan to meet those needs, and the publication of a report. The SCS was given technical responsibility for making the study and the plan, with cooperation from the Charleston County Public Works Department. Among other agencies and individuals who helped were the State Highway Department, U. S. Corps of Army Engineers, the Charleston Chamber of Commerce, a pulp and paper company, and railroads serving the area.

The resulting "Feasability Study of Requirements for Main Drainage Canals," released on April 29, 1963, at a ceremony in Charleston, includes a reconnaissance soil survey of the county and aerial photographs showing existing and proposed main drainage canals, by watersheds. It shows locations for runoff storage basins and pump installations needed for watersheds which cannot be drained by gravity. Most of these are in residential areas.

Engineering data sheets give full information for each main canal system, and the estimated cost for each. The estimated cost of all drainage improvements is nearly

$4 million, not including rights-of-way or engineering costs.

The report is an overall plan to guide the establishment of drainage work by all public and private agencies. For one thing, laterals will not be permitted to extend far across the proposed watershed boundaries and bring an overload to any main canal. The plan proposes that when any watershed, or any portion of it, is to be developed the main canal will be made large enough to serve all future needs. Additional surveys and designs are to be made for each development.

The combined soil survey and drainage plan will serve many purposes:

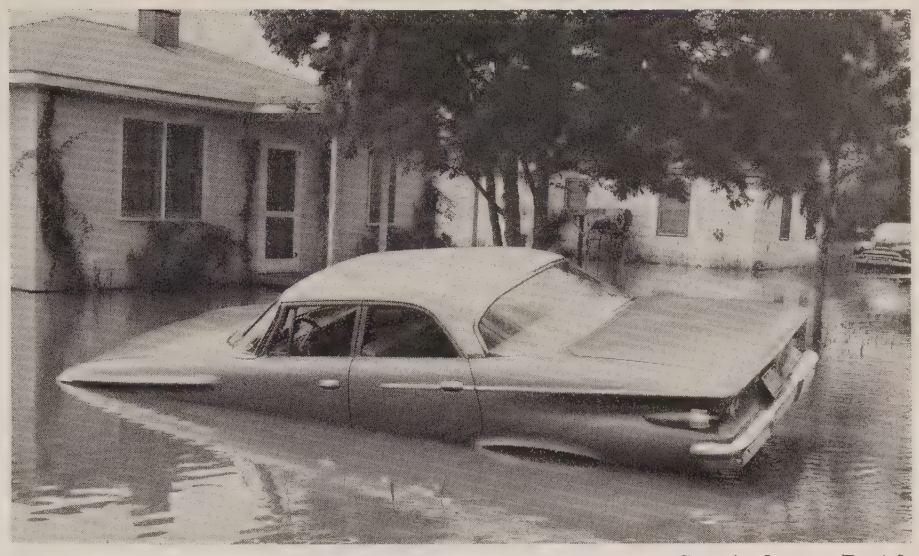
Roads will be located where there will be the fewest drainage and construction problems, and where bridges can be large enough to allow for the increased capacity needed by the proposed canals. The Public Works Department is now using the plan as a guide for these purposes.

Real estate developers, industry, and others likewise can select areas which will present the fewest problems, thus helping private engineers in planning such developments. The Charleston County Planning Department is using the plan for comprehensive planning, and as a guide for zoning.

The plan also provides all physical data needed by watershed groups who apply for assistance under the Watershed Protection and Flood Prevention Act, or through the Accelerated Public Works Program; and it gives the soil conservation district a guide for drainage improvements in agricultural areas.

The study already is being used to guide drainage work in connection with Charlseton's mosquito abatement program.

Because rights-of-way in some areas will be expensive, and may include the cost of removal of some buildings, legislation may be needed to set up organizations with administrative and taxing authority to put the plan in effect. The report



***Urban-area problem:*—This Charleston subdivision in St. Andrews Parish suffered a paralyzing flood after 5.8″ rain in 24 hours.**

***Farmland problem:*—Vegetable field at Mt. Pleasant, S. C., flooded for second time in a month in 1958 because of inadequate drainage outlets.**

***One remedy:*—A typical main drainage canal, dug by Horry SCD for Horry County Development Board.**

gives the basic data needed for such legislation.

"In Charleston County, perhaps more than in any other fast-developing metropolis, we must follow sound plans for land use and for drainage," Graham summed up. "We have no choice. Drainage is essential in all parts of the county. Where we can give adequate drainage, we can build homes and industry. On less-favored sites we can maintain our valuable truck-farming, general farming, and forest industries.

"Step by step we can develop all of our land for the purposes to which it is best suited, and prevent our expanding population from pushing itself out onto the mud flats."

California Urbanization Spurs Citrus Land Shifts—Conservation

By Alex Franklin and Bob Richardson

EIGHT thousand acres of new citrus trees—mostly oranges—have been planted in Riverside County of southern California during the past 5 years because urbanization and industrial growth drove many growers out of Orange and other counties in the Los Angeles metropolitan area.

The move of a number of these growers east into Riverside County is one example of the search for new orchardland that has extended to Tulare County and other areas in the State as orange acreage alone has given way in southern California to nonagricultural uses at a rate of some 10,000 acres a year. Soil survey information and technical land and water conservation assistance are being drawn upon in the location and development of such new citrus lands needed to maintain production levels of one of the State's main agricultural crops.

The continued expansion of citrus plantings in Riverside County, to illustrate, is the outstanding conservation activity of the Riverside-Corona Soil Conservation District. Most of the new citrus planting is on land formerly dry-farmed to grain, with alternative years of summer fallow, that subjected the land to serious erosion losses and deterioration difficult to control.

Major developments have been in the Lake Mathews, Temescal Canyon, Gavilan Hills, and Woodcrest areas of the district. District Directors Jim Topham and Crawford Teague credit the new development in this area to Soil Conservation Service cooperative soil surveys which indicated citrus development possibilities on lands formerly thought to be unsuited for citrus growing, because of soil supposedly too shallow.

Topham and his brother, Robert, started the present expansion in Riverside County 7 years ago when they began looking for new citrus land. The Tophams chose high ground north of Lake Mathews. The elevation meant relatively frost-free growing seasons, plus good air drainage. Most soils in this area are deep enough for citrus, surveys showed, and have good water drainage, though in some areas of limited soil depth frequent irrigation is required, and good management is essential for satisfactory production.

SCS technicians recommended that the soil be chiseled a minimum of 36 inches deep, further to improve drainage and the rooting pattern and to increase the root zone, by breaking up possible restricting layers in the soil. The

New housing subdivision replacing citrus groves in Orange County in summer of 1963.

The authors are work unit conservationist, Stockton; and engineer, Riverside; both of the Soil Conservation Service, California.

Newly planted citrus irrigated with portable pull-hose sprinkler system in Riverside-Corona SCD.

Service also is providing engineering and other technical help with sprinkler irrigation systems, which started coming into more intensive use in the area about 3 years ago.

In 1962, more than 200 acres of scattered citrus plantings were established in the new Woodcrest Mutual Water District alone. Similar planting activity took place in the Gavilan Hills area, as had earlier planting in the El Sobrante, Eagle Valley, and Temescal Canyon areas. The apparent success of these plantings has created a demand for land suitable for citrus, and land values have gone up accordingly.

The expansion of citrus in this area also is a result of availability of Colorado River water, through the Western Metropolitan Municipal Water Company, and of other favorable factors. Because of the water's salt content, good engineering design is required for all irrigation systems, as well as their proper operation and careful management of irrigation water to fit the water-holding capacity of the soil, meet the needs of the trees, and provide for leaching to remove accumulated salts.

The SCS cooperates with all contractors in obtaining good design for irrigation systems. A switch to low head, low pressure sprinklers in irrigation systems in groves planted "on the square," for example, gives uniform water distribution and eliminates the old problem of runoff water accumulating at the lower end of irrigation furrows. More than a million feet of buried pipe and a few hundred miles of surface hose are being installed this year, both in newly developed and existing orchards. Cost of the system varies from $200 to $800 an acre, depending upon their coverage and output.

Earlier plantings were made on contour gradient bench terraces and furrows irrigated around the rolling to strongly sloping hills. Land preparation was proportionately expensive. With most of the newer citrus plantings, the drag-hose sprinkler system is installed without land surface modification, at little or no additional cost. Some growers build terraces and outlets to carry water off their fields without erosion damage.

A continuing study of the problem of salt accumulation in the new citrus plantings using Colorado River water has been made cooperatively by the SCS and the Agricultural Research Service, with participation by the Riverside County Flood Control District. The water is metered at delivery point to each unit at a cost of about $35 an acre-foot.

Because erosion is a problem on new citrus land in the rolling hills, particular attention also is being given to the use of winter cover crops or mulches in young groves.

SCD Director Topham at outlet line for control of runoff water from citrus grove.

Ohio Farmland Is Converted To City People's Playground

By Walter H. Dove

THOUSANDS of Ohioans are finding Logan County their gateway to the great out-of-doors. These include people from Columbus, Dayton, Springfield, Lima, and Marion, who live only an hour away from this natural haven.

Timbered slopes, glacial clear lakes, and spring-fed streams found there are considered by many city dwellers a paradise. Den foxes, rabbits, and squirrels thrive in the area. Bass and trout are abundant in the many clear, cool, spring-fed streams.

In the past 10 years, many organizations have selected heavily timbered areas for lake sites. Logan countians are happy to welcome their part-time neighbors at the various campsites. Many of the new arrivals have called upon the Logan Soil and Water Conservation District, which has helped them with plans to improve their camping areas for recreation and as more favorable habitat for nature study.

The district and the Soil Conservation Service staff assigned to it have provided such help as: Soil surveys of campsites; current information on adaptable plants and animals; and aid in reforestation projects and the building of artificial lakes.

With the soil inventory and a land-use planning map, the owner or representative of each organization listed the conservation needs as he and the SCS technician went over the land, as well as practices and treatment selected by the owner to meet these needs. In addition, management of the woodland and wildlife areas was agreed upon. Access roads and firebreaks were located, along with other measures vital to the recreation planned program.

2,200-ft. ski slope opened in 1962 on John Shoots farm at Zanesfield.

All of the land was converted from farmland, of which 2,000 acres formerly was woodland and 996 acres was rotation cropland. On a 260-acre farm owned by Don Hilliker, for example, more than a mile of trout streams, seven hunting areas, and a lodge have been established on former cropland.

The reforestation program included 300 acres of planting in old stands of timber and on 600 acres of former cropland. Wildlife crops were planted on 300 acres of former cropland. The trees and shrubs were obtained from the Ohio State Department of Forestry, private nurseries, and the State Department of Natural Resources. The State Farm Forester supervised the reforestation planting and woodland marketing. The Agricultural Conservation Program provided cost-sharing.

The conservation plans developed by the owners, with technical assistance from the SCS, show this statistical conservation progress: 161-acre camp with 60 acres in woods and 60 acres in reforestation; 270-acre camp with 71 acres in woods and 147 acres in reforestation; 130-acre camp with 70 acres in woods, 23 acres in lake, and 34 acres in reforestation; 377-acre camp with 221 acres in woods, 2 acres in lake, and 145 acres in reforestation; 80-acre camp with 40 acres in woods and 36 acres in lake.

Three separate Girl Scout councils, with headquarters in nearby cities, are among the organizations represented in this recreation movement in Logan County, a part of which was the last home of the Shawnee Indian tribes before they were moved to the Oklahoma reservations, and still abounds in Indian lore. Indian Lake and the headwaters of the Miami River were enlarged for a feeder to the Miami Erie Canal System in Ohio. The principal transportation of a century ago, this canal system is fast becoming the boating capital of central Ohio.

Two religious denominations also have established camps for use by their youthful members from western Ohio counties.

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Lifeguards instruct swimming class at Camp Wesley on 27-acre lake.

Columbus Y. M. C. A. Camp main building west of Bellefontaine.

Springfield Girl Scouts Camp Macochee headquarters near Zanesfield.

A generation ago, when the Columbus Y.M.C.A. leaders were searching for a campsite, they found deep, glacial Silver Lake at the end of a 4-mile trolley ride from Bellafontaine. It was the recreation center of thousands prior to World War I. Later a deep glacial lake site east of the county seat was developed for public recreation.

Of growing importance in the recreation-conservation picture is the Zanesfield-Jefferson township area, also steeped in Indian lore and including the Zane Caverns and the Ohio Caverns. A dreamed-of ski slope will soon be a reality on the steep wooded slopes just south of Zanesfield. The Valley High Ski Resort, on the John Shoots farm, has been enlarged by 120 acres, to give space for a golf course and thus provide year around recreation.

The county is dotted with kettle-hole lakes left by the glaciers in the dim past. There are 26,000 acres of woodlands in this area. Muck areas and other lake soils in the Zanesfield locality still have a high water table, providing abundant water for springs and wells.

All concerned agree that the opportunity of living in youth camps in this environment is of great value to the young city dwellers. Also, the conservation value of these youth camps cannot be measured in dollars and cents. For example, the campers have been given an opportunity to help plant trees and shrubs, thereby increasing both the material and esthetic values of the area.

The seven youth camps in the county show a total of about 1,200 acres devoted to camping. The camp areas proper include 498 acres in woods, 61 acres in lakes, and 402 acres devoted to reforestation projects. These and many other scenic areas are being used to help meet the recreation needs of the State's exploding population.

Land—Water—People

By Donald A. Williams

THIS year's program theme of the Soil Conservation Society of America—"Land, Water, and People"—again brings into focus the most essential factor in any of our dealings with resource conservation and development in rural or other areas. That is, people! Conservation is for people, and it is only through them that conservation is accomplished.

The U.S. Department of Agriculture for more than a hundred years has been concerned with helping people—farm and ranch people and those with whom farm and ranch people do business in processing or marketing their commodities—make more money from their investment and labor and enjoy better living. The economic advancement and family welfare of people—farmers and ranchers and townspeople in the country's agricultural areas—have been basic objectives of the Soil Conservation Service from the outset of its establishment nearly 30 years ago to provide technical and other help in soil erosion control and related water management and other resource conservation.

But conditions have changed in rural America over the past century, and during the last 30 years. And, of all the changes brought about through agricultural research and technological advancement, none has had more effect upon the rural economy than the general shifting that has taken place from rural isolationism to broader and broader community identification and the interdependence of communities within wider county, watershed, and other areas. Conservation technology and programs must keep pace with and, in fact, be a part of change.

Rural Areas Development and other recent undertakings are designed to make that vast part of America which lies beyond our cities a more economically rewarding and pleasant place for people to live and work today and in the future. Soil and water conservation districts provide the best illustration of how local people can and do bring about rural area advancement through democracy in action.

Donald A. Williams.

No program of the Department of Agriculture better illustrates the idea of Rural Areas Development than the small-watershed program. Under it, a growing number of rural and urban communities have shown that they can halt soil erosion, stop destructive floods, improve drainage, supply water for growing municipal and industrial needs, improve irrigation, establish outdoor recreational facilities, and boost the economy in other ways.

Nearly half of the watershed projects approved for operations thus far are located in counties known to have unemployment problems. Project construction work in such counties, of course, provides local employment aside from the increased employment that may result from industrial, recreational, or other products of watershed development. Furthermore, a large number—177 of the 473 projects appoved for operations as of June 30, 1963—were multiple-purpose projects, which serve rural community developments needs best of all. The projects combine flood prevention with one or more of these purposes: Agricultural water management, recreation, fish and wildlife, municipal water supply, and special agricultural water management.

The 1962 Food and Agriculture Act also provided authority to initiate Resource Conservation and Development projects that will enable farmers, city people, rural communities, and other groups to work together to improve land-use patterns and develop the natural resources of rural areas.

Another provision is for attracting private investment for development of Rural Renewal projects comparable to urban renewal developments. These are to be in "severely disadvantaged" rural areas where much of the land is not in its best use, resulting in chronic underemployment and underdeveloped communities. Any of us who have observed the progress of urban renewal, in Washington, D.C., or elsewhere, can appreciate the possibilities of this rural counterpart. Also in 1962, the small-watershed act was amended to include cost-sharing on public recreational development and allow for the development of industrial and municipal water facilities for future use.

—Excerpts from talk by Administrator of the Soil Conservation Service, at 18th annual meeting of the Soil Conservation Society of America, Logan, Utah, Aug. 28, 1963.

"Let Us Vote for Grass and Water"

By Orville L. Freeman

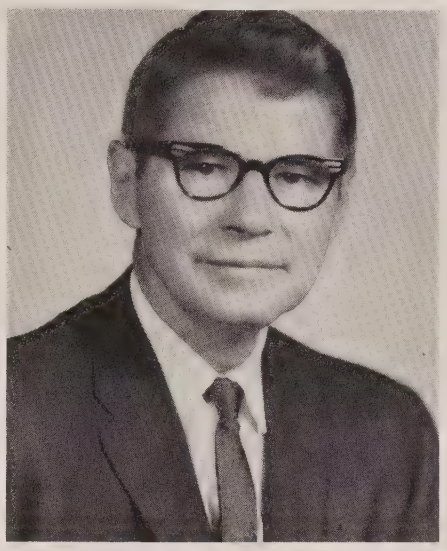
WE have made much progress in conservation in the past 30 years. We can point to many tangible accomplishments . . . . to the almost 3,000 soil and water conservation districts . . . . to the 1.7 million farm ponds now built . . . . to the 1.2 million miles of farm terraces . . . . to the 5 million acres developed as cover for wildlife These are but a few examples.

Conservation is something more than protection—its real message is the use of land, water, air, wildlife, and forest resources, for the fullest enjoyment of all our people . . . The agricultural problem is basically a conservation problem, a question of how we are to use soil and water resources to serve the needs of all people.

For the foreseeable future we don't need more food—actually we need to produce less of some commodities. But there are growing needs of a different sort. Primary among these needs is the opportunity for outdoor recreation. We need, in a society of cliff dwellers and urban housing developments, room to walk . . . . room to play . . . . room to think in . . . . and room to meditate.

This need is converging on us at a time when the crisis point has been reached in agricultural policy . . . . in the decision as to how we intend to use land and water no longer needed to produce food and fiber. If we drift along as we have since the end of World War II, we could emerge from the decade of the 1960's with an aging rural population, gradually deteriorating natural resources, and vigorous and growing urban areas with no room—with sharply inadequate outdoor recreation resources.

A number of proposals are being made to solve the "agricultural problem" which are . . . . basically . . . . conservation programs. One of them would have the Government rent land from the farmer in order to keep it from producing surpluses. The second proposal assumes that the people in rural areas want to move away . . . . that they will fare better and be happier in the city. In my judgment any program to force the outmigration from rural America of such people by economic pressure is economically wasteful as well as harsh and cruel.



Orville L. Freeman.

There is a third way . . . . to constructively use the resources of soil and water to begin a new era in conservation technology . . . . to protect resources in ways that serve people. We call it Rural Areas Development. RAD encompasses most of the activities carried out through soil and water conservation work for many years by the USDA, but it also includes several new conservation tools provided by the Congress in the Food and Agricultural Act of 1962.

All of these new land use programs seek to provide the farmer with a better source of income, to encourage rural communities to make better use of land and water resources, and to expand the opportunities for outdoor recreation for city people. They apply to private land the very successful principle of multiple use by which we administer the Nation's forests.

The 1962 act also provided authority to initiate what we call Resource Conservation and Development projects. They will enable farmers, city people, rural communities, and private organizations to work together to improve land-use patterns and to develop the natural resources of rural areas. These projects will provide an exceptional opportunity for city and urban people living within easy reach of a C&D project to join with local people to create new recreational outlets.

The RAD legislation also authorizes rural renewal projects designed to attack the entrenched poverty now found in many rural areas. This is a bold program similar in its intent to the urban renewal projects which are helping our cities to renovate and rebuild their core areas.

In addtion to these specific programs enacted last year, the overall RAD program involves industrial loans through the Area Redevelopment Administration and through the Rural Electrification Administration; community facility loans and grants through ARA and, to a limited extent, through the Farmers Home Administration; rural housing loans, including a special program for financing housing construction for persons over 65; job training programs which provide rural people with the opportunity to learn new skills which can be used in the

new plants being constructed as part of the RAD program.

These programs complement the on-going programs being carried out by the other agencies of the Department — Soil Conservation Service, Farmers Home Administration, Forest Service, the Federal Extension Service, the Farmer Cooperative Service, the Rural Electrification Administration — which are dedicated to building rural resources.

Farmers are, and must become even more so, the guardians of our soil, water, timber, and wildlife resources. We must find ways to pay them not only for the food they produce—but for other services that we, the public, extract from these resources.

We are succeeding extremely well in taking the food we need—through the efficiencies of agriculture and the marketing system. We must now open the way for the constructive use of resources not needed for food—so they may help meet the broader needs of the rural and urban community.

The land resources are presently great—yet in many instances, especially around cities, the pattern is being cast. To commit land to open green spaces—for the benefit of nature-starved city dwellers—calls for quick action before the concrete closes in. Let us vote for grass and water, not concrete and asphalt.

—Excerpts from address by the Secretary of Agriculture at annual convention of the Izaak Walton League, Cincinnati, Ohio, June 14, 1963.

Iowa Farm Family Scores Par In Converting To Golf Course

By J. Dale Schott

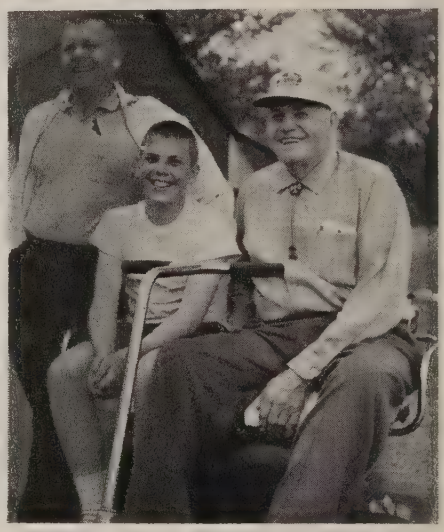
WARREN and Robert Clark's partially converted Iowa dairy and hog farm now has a "carrying capacity" of more than 5,000 golfers a month drawn from the surrounding Des Moines area.

This father-and-son team converted 80 acres of their 240-acre farm into a 9-hole course which attracts as many as 500 golfers on a good weekend. The Clarks are cooperators of the Polk County Soil Conservation District, which helped them in the soil conservation and land conversion program.

Three years ago, the Clark family was operating a 40-cow Grade-A dairy herd and raising about 500 pigs a year. But Son Bob's recurring ill health, diagnosed as an allergy to livestock and other farm things, and a need for rather expensive dairy plant modernization left the alternatives of leaving the third-generation farm or changing its type of operation. The Clarks discussed different plans, which included maintaining the farm as a family unit earning enough income to support and educate a growing family, and to enable Bob's father, still active at 77, enjoy a less strenuous life. None of the ideas clicked until one day Bob on his way home from the doctor, noticed the relatively large number of players on the Wakonda Club Golf Course.

He figured that the golf course was no more beautiful than their own rolling pastures and croplands, and the idea came to him for converting part of the Clark farm to a golf course. Bob's proposal to the family and to friends brought a few raised eyebrows, but he immediately began collecting facts and started a program of self-instruction. He obtained assistance, suggestions, and advice from golfers, golf-course managers, soil conservationists, attorneys, and others, who encouraged the Clarks in their venture.

For example, Floyd Harrison of the Soil Conservation Service working with the Polk County Soil Conservation District pointed out that conversion of the 80-acre tract to a golf course would place more of the rolling land into grass, further reducing soil loss, cutting down the acreage devoted to grain crops, and providing supplemental income to the family farm. Although Bob had never played golf, the game always had intrigued him; and his associations with golfers convinced him that his golf course idea held promise.



Bob Clark (l.) with Nephew Sammy Acheson and Bob's father, Warren.

Much of the farm equipment, such as tractors, trucks, harrows, and grass drills, could be utilized in seedbed preparation, grass planting, and maintenance of fairways

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and greens. Maintaining good fairways and greens would not be unlike maintaining good pastures.

The farm pond put in for erosion control, livestock water, and fishing could be utilized for a source of water supply for operation of an overhead sprinkling system needed for irrigation of fairway and golf greens. The old but well-built 24-stanchion dairy barn could be converted into a suitable clubhouse. The bent-grass stolons needed in large quantities for planting golf greens could be grown in their own farm grass nursery.

The golf enterprise, along with the remaining 160-acre farm, would more than provide gainful employment for the entire family. The location, almost adjacent to the Des Moines Municipal Airport, was ideal. All this, combined with an increasing number of golfers in the Des Moines area, added up to an opportunity for building a successful family enterprise.

All of the Clark's conversion plans were carried out; and today, after 3 years of hard work and cash investment of approximately $30,000, their Willow Creek Golf Course is a going concern. All members of the family help:

Bob manages both the farm and the golf course. His wife and sister operate the clubhouse registration desk, golf equipment rental and sales, and a coffee shop. His sons and nephews maintain the fairways and greens. "Dad" Clark is always ready to help with either the farm or golf course work. A hired man and some seasonal part-time help are used.

The Clark farm conservation plan is being revised, with Harrison's technical help, to convert an adjacent 80 acres of rolling cropland and pastureland to permanent grass for expansion of the golf course to 18 holes. The Clarks recently applied to the Polk County Agricultural Stabilization and Conservation Service for assistance in doing so under the new Cropland Conversion Program.

***1959:*—The old but well-built dairy barn.**

***1963:*—Now an attractive and serviceable golf clubhouse.**

The Clark's new golf course doesn't lack for customers.

Farm-City Teamwork Boosts Virginia Rural Area's Economy

By Gordon S. Smith

VIRGINIA'S Carroll County is enjoying more prosperity as a result of joint town-and-country efforts sparked by two decades of successful conservation farm improvement.

In common with many other rural communities, the county had found itself in an economic pinch brought on by declining farms, creeping unemployment, and other farm-based problems. Today, a thriving agriculture, new home and school developments, new industries, and a solid tax base mark the progress of this southwestern Virginia area's "homemade" rural areas development program.

***Planning.*—Mayor Cooley (center) and Paul R. Batchelor (l.) and William Thomas of SCS discuss new rural development ideas.**

Since settlers first tilled the Appalachian country, row crops had been the mainstay of Carroll County's economy. Then came the stiff competition of modern management for which small fields plagued with erosion, drainage problems, and rocky soil weren't suited. Many farms were abandoned, while some owners held on, looking in town for supplementary jobs. Business, tax receipts, ready money, and credit all were affected.

Looking for an answer to their problems, Carroll County farmers enrolled in the 4-county New River Soil Conservation District locally organized in the early forties. It offered one-stop services available from several Federal and State agricultural agencies, including help making soil surveys and in the then-revolutionary method of land and water-use planning from the Soil Conservation Service. The soil surveys indicated most of the land was better suited for grassland.

Beef and dairy operations gradually spread to abandoned acreages, and farming took a new lease on life. The change solved much of the land-use problem, but most farms still were too small to support families. Idle times and low incomes remained the twin woes of 75 percent of the 3,000 farmers in the county.

***Organization:*—Manager Russell T. Farnsworth explains how two-county C. of C. was formed to help bolster local economy.**

The question remaining was how to create more jobs. A group of businessmen at Hillsville, the county seat, took on the rural development plan assignment that in less than 8 years, with advice and help from the Extension Service and others, was to kick the wolf off the doorstep. Headed by Mayor Raleigh M. Cooley, the group formed the Carroll County Chamber of Commerce. Their first objective was to initiate a rural development program.

A resource inventory was needed, but Carroll County still was on the SCS waiting list. After the Rural Development Committee made a strong case for their urgent need for soils information, the county's soils were completely mapped and classified.

The final report is soon to be printed, but the soils information already has aided development: Guided by soil character, 1,000 soil conservation district farms have been planned for sustained-income operation; and soil data have been useful in locating sites for new industry, schools, and a much-needed inter-State highway.

Strides made in Carroll County caught the eyes of the city fathers at Galax, an industrial center straddling the county line between Carroll and Grayson counties, 13 miles from Hillsville. They also had economic problems, and made proposals that materialized

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***New industry:*—Textile plant built with local funds employs 1,000 local people.**

as today's Carroll-Grayson Chamber of Commerce.

The Carroll-Grayson Industrial Land Corporation, an off-shoot of that parent group, concentrates on new industry. It initiated a local loan-investment program; and $10-to-$20 shares quickly passed the million dollar subscription mark. A national textile firm, attracted by the low-interest loan fund, among other favorable local considerations, built a plant between Hillsville and Galax that now employs 1,000 local people.

The Chamber of Commerce published an attractive booklet listing numerous development sites in the county. The booklet includes maps of sites and information on soils, water supplies, recreation facilities, schools, and shopping areas.

"We soon learned that industry folks always ask the same questions," Cooley recalled. "They want to know about all the aspects of community life right down to names of music teachers. We had to have the right answers."

The ball started rolling. A vacant plant in Hillsville was reopened by a new electrical firm. A nearby chemical plant expanded its facilities. In the past decade, 10 new schools have been built. Motels have sprouted. Hillsville's Main Street has livened. People are spending more money in town.

Farmers, meanwhile, are investing more in conservation, further increasing their incomes. They found that trees, in particular, are a good long-range, profit-making crop; and erosion-scarred hillsides are being protected with them. Last year alone, half-a-million trees were planted in the county. The Farmers Home Administration reports that loans for rural home building and improvement are on the upswing—and there are fewer foreclosures.

The most recent community improvement is the new 172-acre

***New school:*—One of two built this year as part of $3 million Carroll County school construction program.**

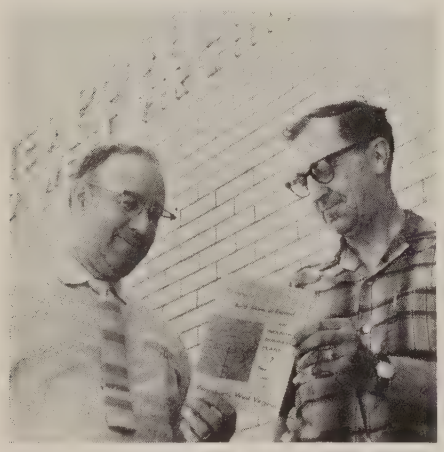
***New woodlands:*—More than ½ million trees have been planted in Carroll County in the past year. Seven-yr.-old white pine on B. C. Vaughan farm.**

Gayhill's Country Club, also a district cooperator. The nine-hole golf course, laid out on an abandoned farm between Hillsville and Galax, was financed by local contributors. Plans include a 1½-acre pond for irrigation, swimming, and fishing, and for fire protection for the clubhouse. Two smaller ponds will add irrigation water and serve as hazards for the dubs. More than a mile of tile and ditch drainage for the layout was also designed by SCS.

Bigger things may be in store for Carroll County. A large power dam is in the planning stage, on New River near Galax. The proposed Stewarts Creek watershed protection project, cosponsored by the New River district, the neighboring North Carolina Surry Soil and Water Conservation District, and the Surry County Board of Commissioners, promises more benefits for Carroll County. The latter project would include 25,600 acres in Carroll County and calls for several floodwater-retarding dams. Multipurpose structures also could provide municipal water, recreation, and wildlife habitat.

West Virginia Watershed Project Ups Farmers' Income—Town's Economy

By Bernhard A. Roth



Mayor Rinehart (r.) discusses watershed plans with Glen Burton of SCS.

DEVELOPMENT of the Bond's Creek watershed in West Virginia started out as a "farmers only" project but soon became a farm-city undertaking with ample benefits for all.

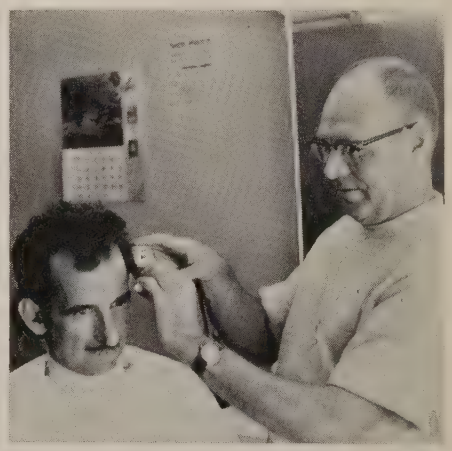
Unruly little Bond's Creek flows near Pennsboro in Ritchie County, where mountain storms spill their rainwaters abruptly into the Ohio River a few miles away. The watershed protection and flood prevention project was conceived as a farmers-only project because 44 farmers are the only private landowners hit squarely by annual $18,000 flood damages in this watershed area on U.S. Highway 50 west of Washington, D.C.

Although the farm losses alone inspired and justified the work, now nearing completion, many urbanites will benefit. In fact, Mayor J. Carl Rinehart of Pennsboro says the watershed improvement is equal to "a new quarter-million dollar industry to us, in the number of people and resources it will bring into our economy." It is credited with having helped induce five new industries to move in during the past few years. With flooding cut to a minimum, farmers collectively stand to realize $15,000 added annual income. This without bringing in new land or harvesting surplus items.

A neighborly spirit extends across the wooded hills separating the watershed from Pennsboro. When the city folks heard of the farmers' watershed struggles, they wondered how they could help. Then Mayor Rinehart and Park Commissioner Beach H. Collins learned a dam was to be built on the other side of the ridge. To them, the dam spelled water; and water spelled fishing, boating, picnicking, and the extension of a badly needed recreation area for the tiny city park.

City leaders checked with the watershed-sponsoring Little Kanawha Soil Conservation District and assisting planning technicians of the Soil Conservation Service. They found that the farm-city needs would jibe perfectly. Engineers readily could add size to the dam to furnish additional water acreage for fish and wildlife and for public enjoyment.

There was a slight catch. The city's tab for the extra feature would be $10,000, or half the actual cost. Maintenance of the structure could run as high as



Park Commissioner — Barber Collins "sold" his customers on watershed idea.

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Local watershed people got credit toward their share of project costs by doing stabilizing work on new dam.

$4,000 a year. Farmers already had pledged $110,000 as their share of the total $368,000 project cost. It took Pennsboro one brief City Council meeting to take the plunge.

By late 1960, every farmer along 6 miles of flood-chewed channel had granted valuable easements. To the last man, they agreed to pony up labor and materials for annual channel maintenance. They were even willing to write it into their deeds to cover the 50-year life of the project. And the city people also had thrown in their lot.

Congressional approval put contractors to work almost immediately shaping, grading, and straightening the new channel designed to steer floodwaters and sediment away from meadows and crop fields, lawns and gardens, barnyards and outbuildings. Farmers and townsmen joined forces to form a watershed association, the better to carry out their respective ends of the job.

Landowners, meanwhile, moved ahead with credit-earning conservation land-use measures to "back up" the structures by helping to keep runoff waters from pouring pell mell down the slopes. They included 20 farm ponds, 80 acres of tree planting and 350 acres of woodland improvement, 500 acres of grazing control, and 2,000 acres of grassland upgrading—plus such incidental measures as controlling erosion on logging roads.

Business, civic, and industrial citizenry of Pennsboro went all-out to fulfill their part of the bargain. When the brush-, rock-, and tree-choked damsite needed a blitz job of clearing to put machinery in action, half the town turned out as volunteers. They, too, were credited in dollars and cents for their labor, more of which was donated when it came time to relocate utility lines.

A hat that was figuratively passed around the area came back brimful. Landowners tossed in as much as $50 apiece; the Ritchie County Court advanced $500; a bank at Harrisville, the county seat, donated $100. A requirement that an additional emergency fund of $2,000 be raised set off a whole circuit of money-raising social events in town, like fish fries, pony raffles, and booster parades. Out on the watershed, ladies of Highland Grange No. 512 put on turkey suppers, some of which drew State officials from Charleston and Federal leaders from Washington. The upshot was the emergency fund went over the top by nearly $1,000.

Today, new grass seedings are growing green along the trimly-shaped banks of the Bond's Creek channel, completed early in 1962. Meadows are producing 3 tons of hay an acre where less than 1 ton was harvested before. Pastures will support 4 animals to the acre —10 times their former capacity.

Pennsboro is forging ahead with its 375-acre park development, including more picnic tables, fireplaces, shelters, and telephone and power lines. Lookouts and trails are being installed for a better view of and access to the 44 foot-high dam.

This is the lake formed by the watershed dam.

District Farmers Profit When St. Louisians *"Go Fishing for Fun"*

By Howard C. Jackson

Lee Moorman, Jr., Wentzville, gets a bite in a "Fish for Fun" pond.

"LET'S Go Fishing for Fun" is a standing invitation each spring from cooperators in the St. Charles (Mo.) Soil and Water Conservation District to their neighbors in nearby St. Louis. This year, during the 2 planned public fishing weekends, 650 fishermen paid the district board of supervisors $551 to fish in ponds and lakes belonging to 20 cooperating farmers.

The idea of "Fish for Fun" came from Les Volmert, Soil Conservation Service work unit conservationist, working with the district. He figured it would be a good way for the district to raise funds for operating expenses. It also would give people in the city a chance to enjoy some recreation and to see good conservation farming.

The district supervisors organize and publicize the annual fishing events, and locate the ponds on a county map. They sell tickets for $1 each. Farmers allow their ponds to be used without cost to the district.

Many farmers let selected individuals come back throughout the season. Some charge for fishing all season, and they like the advertising these 2 weekends bring. Some district farmers are considering increasing their facilities.

Planning and organizing the St. Charles district fishing program has to be done on almost a year-around basis. Good ponds and lakes are lined up; and the year's program-plan is completed about March 1, to give ample time for promoting the program, invariably set for the last weekend of April and first weekend of May.

Ham Schultehenrich, children Don, Jay, and Jan, and nephew Bob caught these.

First, letters and maps are mailed to St. Louis for sportsmen's clubs to use in their monthly newsletters. Next, meetings of the 5 major clubs are attended, when the weekend fishing program is explained and about 10,000 maps are distributed for members to take to their places of business. A letter and other information go to the newspapers and radio and television stations, all of which get complimentary fishing tickets.

The Missouri Conservation Commission handles tickets at its office in St. Louis and distributes maps through its outlets for hunting and fishing licenses. Maps also are distributed by U.S. Department of Agriculture agencies and others to sporting goods stores or any place where sportsmen might pick them up, including industrial plants in St. Louis and St. Charles.

After the first fishing weekend, news releases and pictures of catches go out, and more after the second weekend. The district supervisors pick up the proceeds each weekend, or after the program from the store outlets.

They think this program has many benefits in addition to the monetary profit, including conservation understanding by those involved. The program also improves the possibility of a small sideline income for those farmers who want to have people coming to their places throughout the year.

***The winner*:—5½-pound largemouth bass caught by Bill Harrower, St. Charles.**

The author is State conservationist, Soil Conservation Service, Columbia, Mo.

Bobwhites Draw City Hunters To Georgia Conservation Farm

By R. Hoke Smith

R. F. Burch, Jr. (l.); his son, R. F. Burch, III, (r.) and Dr. E. D. Jones of Baltimore and his dogs.

HELPING sportsmen from as far away as Baltimore and Chicago have fun hunting quail on their farm is not only an interesting job for a Georgia father and son—it's a paying business. Every year, from around Thanksgiving until the latter part of February, hunters from at least a dozen States spend a week or two as paying guests shooting bobwhites on the 4,000-acre farm of Dr. R. F. Burch III in the Central Soil and Water Conservation District in Dodge County.

For several years, Dr. and Mrs. Burch have been providing rooms and meals at their home on the farm for the hunters, with his parents taking care of the "overflow" crowd at their larger home in Eastman. The veterinarian-farmer and his father plan to build a three-bedroom guest home as part of their priority quail-hunting expansion on their farm near Eastman.

Hunters pay $35 a day. That's for all costs, including food and lodging; dogs or kennels, and care for the hunters' dogs; guides, and transportation to and from hunting areas. Wives are charged $10 a day—whether they hunt or not! For their money, the city hunters find abundant game flushed from sprawling grain fields bordered by shrubs, pines, and hardwoods, along with home-cooked meals and Southern hospitality.

"Wildlife conservation is an important part of our farming operation, and it fits well into our overall program," says Burch, a member of the board of supervisors since the district was organized 15 years ago. "Wildlife thrives when good conservation is practiced, but if erosion washes away the topsoil it cannot produce the food and shelter needed by the birds and animals."

Ever since, the Burches have been cutting down on their acreage of cotton, corn, and peanuts and putting more land into pines, pastures, and wildlife plantings. They now have 2,000 acres in pines and 1,000 acres planted to Coastal ber-

Drs. Jones and Burch set out to shoot quail on the Burch farm.

The author is area conservationist, Soil Conservation Service, Perry, Ga.

mudagrass and Pensacola bahiagrass for beef cattle. They have had Soil Conservation Service technical help in making these changes, building farm ponds stocked with fish, and in working out their wildlife plantings.

Burch was Dodge County's first county agent, back in 1918-19, and has been a strong promoter of soil and water conservation through the years. He also has been a county commissioner, State representative, State natural resources commissioner, and head of the State Parks Division.

The Burches use plants that provide food for the quail during the late fall, winter, and early spring —perennial bicolor lespedeza, annual lespedezas, oats, wheat, rye, cowpeas, corn, browntopmillet, soybeans, and a special field pea that the bobwhites go for. Quail also find berries and other natural foods on the farm.

Burch has devoted full time to development of the wildlife program, the quail hunting business, and taking care of the dogs for the past 3 years. He's convinced that there is a need for wildlife conservation development on more farms, and making them available to hunters, because privately owned land produces about 80 percent of the Nation's game.

Dr. and Mrs. Burch and his parents all enjoy entertaining their guests and look forward to having them back every year. And most of them do come back—for instance, hunters like Dr. Everett D. Jones, an orthopedic surgeon of Baltimore, who has hunted with the Burches for five seasons and is a member of a conservation committee of Ducks Unlimited in Maryland.

"The fact that folks come all the way from Philadelphia, Chicago, or Cleveland to hunt a couple of weeks with us—and keep coming back—is proof enough that we have in Georgia a good farm potential that could be more fully exploited," Dr. Burch points out. "But a person should have sufficient acreage, although not necessarily as much as we have, food and cover for the birds, a keen interest in hunting and wildlife and in people, and be prepared to do a lot of the work himself with help of members of his family. Labor costs could eat up his profits."

Fun for 100 Maine Families in Conservation Farmer's Woodland

By Lester Fox

ONE hundred families of Bangor and neighboring Maine communities have a conservation-minded farmer to thank for a recreational paradise they are enjoying the year around. He is Calvin B. Johnson, whose 400-acre woodland, that he also operates as an income-producing tree farm, offers skiing, tobogganing, skating, snowshoeing, sleigh riding, swimming, fishing, horseback riding, hiking, hunting, exploring, picnicking, bird watching, and nature study.

Johnson's recreational development has stimulated community economy. It operates on a yearly budget of $10,000, most of which goes for local labor. Members buy their sports togs and gear from local stores. Financing has been through a Bangor bank, with no expenditure of funds by the City of Bangor or the surrounding communities.

The ski association membership is limited to 100 local families, with guest privileges. Annual membership dues are $105. Families that don't use the ski lift pay $30.

Johnson owned and operated a 90-acre dairy farm at Hampden, 3 miles south of Bangor, when a new State law would have required him to invest $18,000 to $20,000 in remodeling his milking parlor and installing new equipment. He sold his cows and went into the business of boarding horses. Then he bought the 400-acre woodland near Newberg, about 12 miles west of Hampden.

Seeing a need for outdoor recreational facilities, Johnson joined seven other local residents in forming Ski Horse Mountain Associates, Inc. They and others then organized the Ski Horse Mountain Association. The association plans all recreational activities, but Associates, Inc. is responsible for all financing. To get the enterprise started, the Associates obtained a $30,000, 20-year loan, and $7,000 on a demand note and other sums for short periods from a Bangor bank.

Johnson sold 15 acres of his woodland to the Associates for $300 for building sites. He donated full use of the remaining woodland without cost or restriction.

Associates, Inc. awarded a local contractor the $8,000 basic job of fixing up the woodland for recreation. The work included clearing

The author is field information specialist, Soil Conservation Service, Upper Darby, Pa.

slopes for skiing and tobogganing, and building a farm-type pond for swimming, fishing, and skating. Buildings to accommodate horses were erected, trails were made through the woodland, streams were improved for fishing, water supplies were developed, and a large, prefabricated building was bought from a local firm and set up as a lodge by the pond. A $15,000 T-bar ski lift was the last installation.

Before the woodland work was started, a conservation plan was drawn up with help of Soil Conservation Service technicians. As a cooperator with the Penobscot Soil Conservation District, Johnson had applied 20 complementary practices on his dairy farm. This program had controlled erosion, conserved water, built up fertility, and increased his grass crop yields.

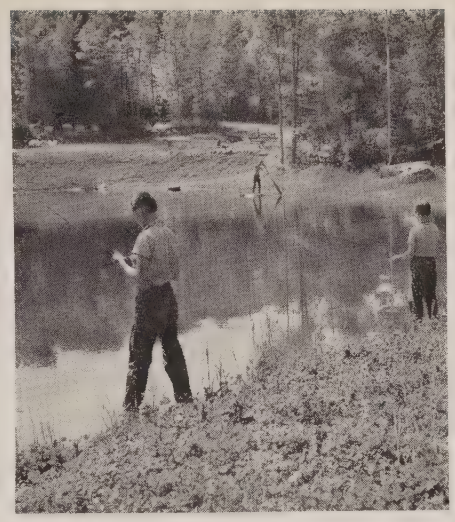
The woodland conservation plan included seeding the ski and toboggan slopes to red fescue grass and red top and Ladino clover, with lime and fertilizer. That gave the slopes a good base for the snow and furnished an erosion-resisting sod.

To be doubly sure the soil would not wash away, Johnson installed miniature diversions across the slopes. They carry runoff water into the adjoining woods, where the soil absorbs it and holds it in storage.

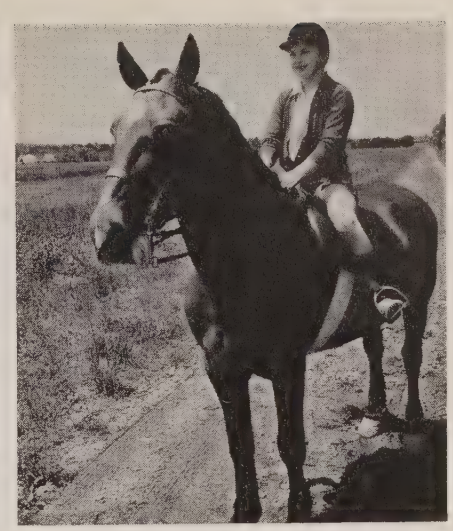
Ex-dairy farmer Johnson boards about 30 horses, at $33 a month. The horses are owned by association members and are used mainly by their children. The farm is now all in hay. He grows 120 tons a year on 60 acres, and buys 25 to 30 tons locally.

Johnson has his woodland under a sustained-yield plan he worked out with the Maine Forest Service. So far, he has made a 10-acre harvest of cedar for fence rails and poles for building a stable, and has weeded maple and beech for pulp.

There are other rural area and community benefits resulting from Johnson's woodland conservation development. For example, rural fire departments receive training in new techniques. The Maine Forest Service holds firefighting schools for them in the woodland. It also holds schools for University of Maine forestry students, and takes Boy Scouts and other groups on educational tours through the woodland.



***Fishing:*—These boys enjoy fishing in the pond on the farm near Newberg.**



***Riding:*—Cynthia Higgins is one who used Johnson's bridal paths and riding ring.**

***Skiing:*—Recreation Director Sandy Gregg and family on Ski Horse Mountain course.**

◆

"Soils Suitable for Septic-Tank Fields," by William H. Bender, Soil Conservation Service, U. S. Department of Agriculture Information Bulletin 243, demonstrates the need to have satisfactory soils and a properly installed system in order to have adequate septic-tank filter fields. It discusses filter failures, use of soil surveys and maps, soil factors affecting the fields, and ways of calculating size, and gives pointers for selecting a site for filter fields.

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WOMEN SEE WHERE FOOD COMES FROM

By Mrs. James Nauss

HAVE you ever been hungry? I mean that kind of hunger that comes when there is no food to eat or, at best, perhaps a handful of rice!

I am an average American, and the average American in our great land of plenty has seldom been hungry as great numbers of the world's people are nearly always hungry. Until recently, I'd given little thought to the source of my food—I had just gone down to the supermarket and bought those foods I needed and could afford. But a recent tour sponsored by the Coastal Soil Conservation District of Texas changed that indifferent attitude.

This tour—the first in the district for women—was arranged for representatives of the local garden clubs and two other women's clubs. The response was good. Sixteen women representing seven clubs attended. Included in the group were Mrs. E. L. Meley, State conservation chairman, and Mrs. H. L. Taylor, Magnolia district conservation chairman of the Texas Federation of Women's Clubs; and Mrs. Elden Gaus, wife of one of the soil conservation district supervisors.

Work Unit Conservationist Genie Warren, Jr., of the Soil Conservation Service conducted the tour. We visited three farms in the Beaumont area and were shown good pastures, improved with grasses which grow well in the Gulf Coast area. We were told the advantages of a crop rotation using ricefields for pasture 1 year out of 3. While the land is in pasture it is being rested and enriched, at the same time it provides grazing for cattle, thereby producing food instead of just lying idle.

We observed another good conservation practice—allowing the cattle to graze the grass down only to an optimum height, so the grass plants can recover their growth rapidly and provide cover to prevent soil erosion and supply feed again next year. At our last stop—a large rice farm—we were shown the importance of proper drainage and irrigation systems.

They learned about farmer's problems and conservation values.

The author is clerk, Coastal Soil Conservation District, Beaumont, Tex.

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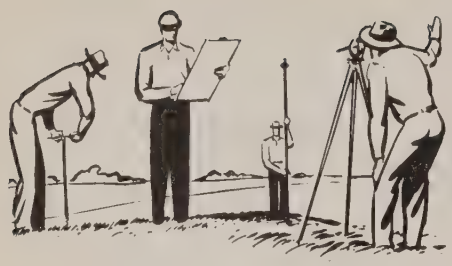

God has lent us the earth for our life; it is a great entail. It belongs as much to those who are to come after us, and whose names are already written in the book of creation, as to us; and we have no right, by anything that we do or neglect, to involve them in unnecessary penalties, or deprive them of benefits which it was in our power to bequeath. And this the more, because it is one of the appointed conditions of the labour of men that, in proportion to the time between the seed-sowing and the harvest, is the fulness of the fruit; and that generally, therefore, the farther off we place our aim and the less we desire to be ourselves the witnesses of what we have laboured for, the more wide and rich will be the measure of our success.

—The Seven Lamps of Architecture
By John Ruskin

VOL. XXIX, NO. 5 DECEMBER 1963

CONTENTS

Page

99 Lake County Uses Soil Survey in Planning its Urban Areas
By John Quay

103 Ela Township's Planning Involves 119 Soils
By Raymond L. Newbury and William H. Bender

105 Soil Surveys Help People Make of Their Land What They Wish
By Charles E. Kellogg

107 Golf Course—Homesite Developer Revamped Plan to Fit the Land
By Roy C. Anderson

110 Health Official Says Soil Survey "One of the Most Useful Tools"
By John G. Morris

113 Urban Growth Spurs Planners To Look for Basic Land Facts
By Frank S. So

116 Conservation District Program Serves Rural and Urban People
By Elmer E. Offerman

119 Soil Surveys "Move To Town"
By A. A. Klingebiel

COVER PICTURE—Portion of new plat for Long Grove Country Club Estates development in Lake County, Ill., showing golf course fairways relocated on the basis of soil surveys to leave more favorable sites for home building. (See pp. 107-109.)

Soil Conservation

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FRANK B. HARPER, Editor

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Lake County Uses Soil Survey In Planning Its Urban Areas

By John Quay

WE are using soil facts in urban planning in Lake County. We will make even better use of them as soon as soil survey maps are available for this entire Illinois county and the maps and terminology are translated into terms more meaningful to the professional planner or interested lay citizen.

The Ela Township survey, completed in March 1962, was the pilot study that proved to our Lake County Regional Planning Commission and our County Board of Supervisors that we were started in the right direction. We now are embarked through technical services of the Soil Conservation Service in a survey of the entire county. It will help us deal with our continuing urban expansion problems.

As chairman of the Ela Area Planning Board and vice-chairman of the County Planning Commission, I am interested in both regional and detailed planning. In the 6-county Illinois part of the Chicago metropolitan area, 6.2 milllion people are using about 30 percent of the land area for urban purposes. Lake County's share of the metropolitan total is 300,000 people, again using about 30 percent of the land area. The other 70 percent of the county is agricultural land, forest preserves, lakes, and miscellaneous undeveloped tracts.

While the surge of population growth outward from Chicago will continue, even the most optimistic population projections for the next 20 to 40 years do not indicate that all nonurban land will be needed for urban uses. It would therefore seem reasonable that a prudent planning official would want to guide urban interests toward geographical areas best suited for such development. And, going one step further, he would want to advise both public and private interests of the hazards and opportunities within a geographical area.

Soil mapping for farmers and ranchers has pointed out alternative methods of using the land and saved rural landowners from trying to grow crops unsuited to their environment. A kernel of corn, planted in a soil with an excessively high water table, will have a difficult time germinating and growing to maturity. Houses, roads, factories, and public buildings "planted" in saturated soils will, like the corn plant, have to divert some of their growth resources to overcoming water-related problems.

Practices that have worked well on farmland sometimes do not fit urban needs. Tile drainage is an example. When the land use changes from farming to an urban use, and the drainage system is no longer maintained or is destroyed, the field tends to revert to natural conditions that existed prior to installation of the system. When this happens, and houses are built in the area, we have flooded basements, roads that prematurely disintegrate, septic systems that do not operate properly, lawns that will not grow grass, and a general community liability instead of a fine residential area.

The author is vice-chairman of the Lake County Regional Planning Commission, Barrington, Ill.

Planners in metropolitan areas and other urban-rural communities throughout the country are making practical 20th century application of the lesson taught by the Biblical story of the foolish man whose house built on the sand fell when the rain descended and the floods came and the wise man whose house built on a rock fell not. They have learned there need be no such "foolish" home builders in this day when scientific information is available to tell them beforehand if the footing for their houses is sound.

This information being relied upon by more and more local planners, zoning and other authorities, and builders is contained in soil surveys. Long used primarily as guides for farmers in growing their crops, these diagnoses of soils, charted in detail on reference maps, are equally useful in showing whether a given piece of land is suitable for buildings, underground sanitary or other utility systems, for streets or highways, or for other essential facilities. If it is not suited to such uses, the soil surveys tell planners, landowners, and developers whether the soil properties, water-table level, slope, and other factors indicate the land may be used to better advantage for agricultural, recreational, or wildlife purposes.

This issue of SOIL CONSERVATION presents the first-hand experience of planners and developers with the successful use of soil survey and related land-use guides in one representative locality beset by urban growing pains—Lake County outside Chicago, Ill. The rewarding lessons they have learned there apply as well in principle in urban growth areas anywhere.

Here, planner, developer, sanitary engineer, soil scientist, and conservationist together tell, step by step, how the job is being done in Ela Township and Lake County. Other examples of soil survey use may be found in these issues of SOIL CONSERVATION: December 1962, October 1962, November 1962, November 1963, and others.

Chairman Quay (r.) and Ela Area Planning Board members study soil interpretation maps. (His left): John Walt, Clarence Voras, Harold Wilder, Larry Hartlaub, Walter Dobbins, Henry Knigge, Rita Cole.

Soil mapping with agricultural interpretations provides the basis for an agriculturally oriented, colored land capability map. Urban planners need colored capability maps, too; and this is exactly the way we are using facts turned up by the Ela Township soil survey and other township surveys currently being completed.

With help from our commission's director and staff, we have prepared seven colored capability maps, all based on interpretations given in the Ela survey. All have special significance in urban planning. Interpretations, each on a separate enlarged map, include: Percolation rate, bearing strength, degree of slope, flooding potential, depth to water table, corrosion potential and agricultural capability.

To be consistent, we used the same color code to cover different degrees of hazard in each interpretation as are found in the widely used farm land capability maps. Thus green shows absence of special problems, yellow is in the area of caution, and red is in the danger zone.

Translation of cold facts into a visual presentation of this kind is important to us in Lake County, because it enables us to do more positive planning based on understandable facts. Up to this time, not having specific information that we could easily communicate to others, we sometimes have had to be defensive in our operations. Let me explain:

A subdivider went to a local village planning commission a while back with a request to put a new road along the edge of a swampy area. Looking at the swamp grass and cattails and examining the soil maps, the planning officials questioned the wisdom of the location. When he persisted, the village authorities prescribed special requirements for construction and maintenance that placed the major responsibility on the sub-divider. Use of soils information thus protected local taxpayers from heavy repair costs if the road should sink or break up.

However, if the soil facts had been used in a positive manner to begin with, the road could have been kept back on high ground and the spoiling of a potential lake site prevented. Such a change also would have made it unnecessary for pedestrians to cross the road to reach a future recreation area.

Few of our urban problems can be corrected economically after the wrong land-use decision has been made, but a great many can be prevented before the decision is made. As county officials, we on the County Planning Commission are available to give advice and assistance to 45 local municipalities. We and other planning bodies advise developers, individual property owners, locally elected officials, attorneys, civic groups, and representatives of industry, transportation, and utilities.

In Lake County alone, 2,000 or more elected or appointed officials are in a position to make or to influence decisions on land use. When we on the commission work with them, we can't afford to be negative. We should be able to give the facts in 30 seconds, while the inquirer is interested and before he makes a decision. The colored interpretive maps are the best way we have found to reach the individuals involved.

The right soils information at the right time can prevent a lot of idle talk. Arguments about physical problems at a given site can go on for hours, because of defects in memory, differences in vantage points, and lack of understanding. Precise soil descriptions and interpretations can be an immediate conversation-stopper at many conferences, particularly when presented visually.

For example, a developer recently presented to the planning commission of an Ela Township village the plat of a proposed subdivision. Looking at the soils map, we found one lot to be entirely in a depressional area. The soils had a high water table, and during most of the year septic system performance would have been zero. Filling the hole would not have been a solution, as the basement footings still

would have rested on wet, unstable soils.

With the soils information, we were able to point out these facts. As a result, the developer will put homes on either side of the undesirable building site, and the low area will be available for recreation or wildlife.

Monetary losses are usually sustained by the people who can least afford them—young couples who put a heavy mortgage on a $13,000 home built on a flood plain, or who buy a split-level home that actually does split because of settling. For many people, also, home-buying brings on a highly emotional condition. When they decide to buy a home, they have a dream in mind, and things they see that tie in with the dream may loom out of proportion to other considerations.

When they move in and the walls crack, the basement floods, the septic system doesn't work, the grass won't grow or plantings die—because of unsuspected soil deficiencies—the disillusioned home buyers usually are left holding the bag. Their reaction is to lay the blame on anyone who might have been involved—public officials, the developer, builder, or real estate broker, and sometimes even the neighbors. Intelligent use of soils information by all concerned can help prevent such misfortunes. An erodible 18 percent slope, for example, sometimes does not show up on a developer's plat; and any level land covered with grass looks good to the inexperienced buyer, though it actually may be too wet or otherwise unsuitable for home building.

In the North Libertyville estates, which were on a flood plain of the Des Plaines River, 120 families had to be removed from their homes in a 1960 spring flood. The Lake County Red Cross estimated damages at $200,000. In a subsequent town meeting, the heavy turnout of voters from this subdivision helped to vote in a proposed soil-mapping project for the township. They were willing to vote their tax money for this means of helping to prevent future home building on flood plains.

In recent months there has been an increased awareness among our public officials of the need for soils information when working with urban development problems. One example: A Vernon Township schoolboard member asked for a statement on soil problems likely to affect construction of an addition to a school. And he wanted the information before working on a bond issue—not after the project got under way.

Because use of soil maps is a new approach in urban planning in local governments, we may have a tendency to seek dramatic applications; but the real benefit to the public lies in our using this information in such ways as these:

(1) Realinement of a subdivision road a hundred feet to one side in order to miss a spot of structurally unstable soil.

(2) Reshaping of a lot in order to include a more porous soil for the septic field.

General Soils Map of Ela Township

LEVEL WET SOILS DEVELOPED IN ORGANIC AND STREAM-LAID MATERIALS
- Houghton-Otter-Sawmill Association

LEVEL TO GENTLY ROLLING SOILS DEVELOPED IN MEDIUM-TEXTURED GLACIAL DRIFT
- 2 Symerton-Corwin Association
- Tuscola-Grays Association

LEVEL TO GENTLY ROLLING SOILS DEVELOPED IN SILTY CLAY LOAM GLACIAL DRIFT
- 4 Elliott-Martinton Association
- 5 Varna-Elliott Association
- 6 Morley-Beecher Association
- Blount-Morley Association

GENTLY ROLLING TO HILLY SOILS DEVELOPED IN SILTY CLAY LOAM GLACIAL DRIFT
- 8 Morley-Varna Association

THIS?—Typical flooding in 1960 and 1962 in subdivision built on Des Plaines River flood plains.

(3) Selection of plantings for a park or parkway on the basis of soil types.

(4) Building of a dam and lake on soils not suitable for house construction.

Lacking a backlog of experience in the total application of soils knowledge to urban development problems, we in Ela Township—to say nothing of the county as a whole—have only started to explore the many interpretations from one soils map. One is with respect to the opportunity for recharge of ground-water supplies, a growing problem throughout our area. With the construction of reservoirs in the more suitable sites and better management of our water, we should be able to help assure a continued supply of good, usable water.

Another objective of our Planning Commission is up-dating the county's 1939 zoning ordinance in line with today's developments and future needs, with the help of land-use studies and a long-range plan. Soils information now becoming available is proving most useful in this work.

Township and village planning officials also are interested in coordinated development and the improvement of zoning ordinances. The Ela Area Planning Board has representatives from each of the six villages in the township. They review plats submitted by developers and coordinate overall planning and development. A good example was the use of soils data by the village of Long Grove during

Undercut culvert and eroding ditchbanks in a new subdivision.

recent negotiations with a local developer for the more than 500-acre Long Grove Country Club Estates, a combination golf course and homesite development.

In an area of rapid and varied development such as exists in Lake County, there must be constant vigilance by these local officials to see that each daily decision adds up to a sensible and imaginative future. As we on the County Planning Commission work with them, it is good to know that we have an effective tool in the soil survey, that will be applicable to both the incorporated and unincorporated areas of our county. We are looking forward to the day when surveys like that for Ela Township will cover the entire county.

OR THIS?—There is no flood danger for this properly located play area in Plum Groves Estates in Cook County.

Ela Township Planning Involves 119 Soils

By Raymond L. Newbury and William H. Bender

SURVEYING Ela Township's 119 soils was a first essential to planning solutions to land and water problems caused by rapid urbanization of this Illinois area some 30 miles northwest of the Chicago Loop.

Six-mile-square Ela Township in Lake County originally was developed for farming, which still is an important land use there; but much of the land now is being converted to use for residential, transportation, industry, and recreation facilities. A mixture of rural and urban land uses in the township presents complex soil and water problems to both the farmer and city dweller. The more than a hundred different soils occur in 2- to 30- acre areas.

Co-author Bender uses soil profiles to explain differences in Ela Township's 119 soils to planners and developers.

The most serious soil and water problems encountered by urban developers are flooding, seasonal high water tables, corrosion of utility pipes, poor septic tank functioning, and foundation failures. These problems often don't show up until after the investment has been made for construction of buildings and installing facilities.

Some means was needed to anticipate these problems, and the people in Ela Township asked the Soil Conservation Service for help with a soil survey that could provide the needed information. Soil scientists walked all over the township digging holes to examine and identify the soils, and recorded their findings on 4-inch-to-the-mile aerial photographs.

The soils were found to occur in a complex pattern, influenced by the kind of geological material and the topography of the land surface. Repeated soil borings had to be made in order to make adequate soil maps.

To the 5-foot depth, the random dominant deposits consist of medium textured material (containing coarse, cobbly gravels), laid down by glacial meltwater, and silty clay loam materials deposited by the glacier itself. There also are numerous, scattered depressional areas containing organic (muck) materials, and narrow stream bottoms in the eastern part of the township contain alluvial materials. Knobby hills and swampy depressions are combined in a highly uneven land-surface pattern. Surface drainage is not well developed, and the numerous depressions tend to collect runoff water from adjacent slopes.

Even on the general soils map—developed to present the "big picture" after the detailed soil maps were completed — the "ingredients" of 119 soils look as if they had been stirred by a giant spoon, though each of the 8 general soil areas has a relatively uniform pattern. This general soil map is useful to those who want to compare broad areas within the township, and provided a means for making general predictions as to the kind and frequency of problems encountered by rural and urban land users and by county and regional planning people.

"Good cow pasture—but will it do for people?" (L. to r.): Planner John Quay, Co-author Newbury, and SCS Conservationist Elmer Offerman.

At the community and village levels of planning, it is the detailed soil maps that become the basis for obtaining a "close look." Interpretations are broken into great detail for the five major land uses—agricultural, residential, industrial, transportational, and recreational.

Under agricultural use are interpretations in relation to each soil: (1) By capability classification—use potentials, and risks and limitation in use; (2) management—best use and conservation treatment needed; (3) crop yield estimates; and (4) crop adaptations. The soils also are interpreted for their suit-

The authors are assistant State soil scientist and soil correlator for interpretations, both of the Soil Conservation Service, Urbana, Ill.

A bleak prospect for new homeowner—who finally got lawn to grow where topsoil was stripped off.

ability for growing wildlife food and cover.

There likewise are guides for planting lawn grass, shrubs, vines, and trees in relation to the different soils, and for water management in terms of flooding hazards, agricultural drainage, and sprinkler irrigation.

The engineering properties and interpretations of the soils are quite detailed in the soil report prepared for Ela Township.

First, are data showing the results of six standard laboratory and field tests. From these data and other observations, tables were compiled for (1) pH (soil acidity or alkalinity), (2) hydraulic conductivity, (3) percolation rate, (4) bearing strength, (5) shrink-swell potential, (6) erosion potential, (7) susceptibility to frost, and (8) susceptibility to erosion. Additional tables show suitability for (1) septic tank disposal fields, (2) building foundations, (3) trafficability, (4) road subgrades, (5) winter grading, (6) road base, (7) sand or gravel, (8) topsoil, (9) compaction character, (10) pond embankments, and (11) pond lining materials.

The soil scientists who made the Ela Township survey suggest a number of imperative requirements for such a survey:

A consistent high quality of soil maps is needed. This means that experienced soil scientists must do the job.

For the soil maps, use the best available photographs. Use 8-inch-to-the-mile field sheets if the complexity of soil and land patterns are extreme. Delineate small areas (even less than 1 acre) of real problem soils, such as the mucks. Make a greater than normal number of borings to verify soil identification. It is most desirable to make soil maps when the soils are moist and the crops are less than "head high."

Talking and working with county, township, and village planning people, with the tax assessor, and with the local Health Department people is necessary. It also is important to talk with as many other people as possible, to learn their experience with wetness, flooding, septic tank function, and so on. Such information helps the soil scientist assess the soil properties of permeability and percolation as related to septic tank filter field function; flooding and ponding potential and surface waterflow character for lowland sites; and marsh and high water-table areas, especially where there are abandoned farm drainage systems.

A study of geologic literature, along with drill-rig borings, similarly help dispel many questions about depth to bedrock. Watch for potential sites for future "dry" ponds, for future ground-water recharge use.

Remember during the survey, and in preparing the report and dealing with the people who will use the information, that there are limitations in any soil survey. Urban planners want to know the kind and degree of problems and limitations in land use; but soils are only one of many phases that the planners consider, and they may tend to take the soils information as being so reliable they can reduce the onsite investigation.

A building lot with a septic tank field, for example, cannot be evaluated adequately on the basis of a soil survey alone. The soil survey serves as a dependable guide, or preliminary investigation, to the location of suitable sites for construction of buildings and installation of other facilities. But even in survey maps of high quality, we must allow for the fact that up to 15 percent of soils of a different kind than that indicated for a given area may occur.

Furthermore, planners need to understand that soil-unit lines delineated on maps never can be so precise that they can be laid out with pegs and string on the land with the statement "that side is all good—this side is all bad."

And, of course, much yet is to be learned through research and experience about the full properties of many soils for urban use. Until we have more information, interpretations must be based on presently known facts, because studied conjectures will not suffice and even can be dangerous. On the other hand, many facts are known and proven, and these are available in a soil survey. Used within its limitations, the survey, along with adequate onsite examinations, can help planners not only to avoid costly mistakes but also to develop a much more satisfactory situation for human living and enjoyment.

Soil Surveys Help People Make Of Their Land What They Wish

By Charles E. Kellogg

THE American people can make of their land what they wish. Few other countries have such flexibility.

Unlike several crowded countries, we have abundant good land. We have many different kinds of soil that are good for farming. We have many that are good for houses, for playgrounds and parks, for trees, and for grass. We do not need to use unsuitable soils for any of these purposes. We do not need to crowd the houses for increases in population onto poor soils for houses. We need to have neither rural nor urban slums.

The same principles that lie back of the great agricultural improvements of the last two decades in the United States can be applied as well to the rural-urban space being filled by our increasing population. What we have learned about selecting soils for farm and forestry use can be applied equally well to selecting soils for housing, highways, golf courses or other recreation facilities, and for other uses. We have no need whatever to put houses where they may slide down hill, settle and crack, or be flooded; or where they cannot be beautified with growing plants.

The same can be said of the principles for managing soils for the conservation and use of water. They, too, are applicable to the rural-urban complex around our cities and along our highways.

The underlying principles of runoff control, drainage, irrigation, and the storage of water for agricultural uses apply in urban areas. Unhappily, this fact is not yet well known. Some of the worst runoff and erosion is taking place within the city limits and in

Man can misuse the land—tear the earth apart to put up his puny buildings where it best suits his convenience and pocketbook.

Or he can plan attractive developments like this on a former Maryland dairy farm near Washington, D. C.

The author is deputy administrator for soil surveys, Soil Conservation Service, Washington, D. C.

the urban fringes around them, especially during the development period.

The same is true of principles and devices for growing plants. With a medium of attention and cost during development, trees can be preserved and the soil left in good condition for growing ornamental shrubs and other plants around homes. These principles also apply in using grass and other plants on street and highway rights-of-way and other areas where earth is disturbed in construction.

Americans now have an opportunity to develop new living space with advantages of both country and city. Within this space we can have fields, forests, parks, water surfaces, and abundant wildlife. At the same time, we can allow enough density of homes to support efficient schools, shopping areas, clubs, and other centers of city life. Both the country families and the city families can have richer lives.

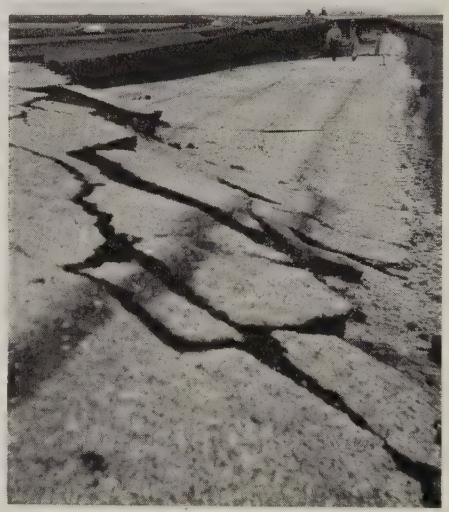
Soil classification and mapping of our rural lands began in 1899, and today has been extended to many urban landowners as well. These soil surveys are made by the Soil Conservation Service in cooperation with the State agricultural experiment stations and other State and Federal agencies having immediate needs for them.

Engineering interpretation of the basic soil classification used in soil surveys began in the Michigan State Highway Department during the winter of 1925-26. The benefits in cheaper and longer lasting highways were enormous. Yet the methods spread slowly until World War II, when they were widely applied in military engineering. Since 1950, both the data for engineering interpretation of our thousands of kinds of soil and the use of these interpretations with soil maps have increased, until now much of this work is going forward in both rural and urban areas.

Local support for soil survey work in some urban areas came only after some sort of catastrophe, such as costly failures in roads, houses, sewage fields, or other expensive structures. Depending upon the kinds of unsuitable soils used, houses may have wet foundations during certain seasons, be flooded irregularly during stormy periods, or even slide down the slope. Sewage fields oftentimes fail to function, houses settle unevenly and crack as the soil swells and shrinks, and many house lots are extremely difficult to beautify with living plants.

The cost of soil surveys for orderly planning is only a fraction of that of failures or unneeded overdesigns. Yet the opportunities from improved soil use go way beyond the prevention of such costly failures, which are almost inevitable without good basic soil surveys made before site location and construction. And because we have soils that are suitable for housing in the urban-fringe areas, the bad sites can be avoided.

If he fails to build on the right kind of soil, his houses crumble.



Or his highways break up and—like this one—have to be relocated.

Areas of good and poor soils are usually intermingled as an intricate pattern. Thus, by planning the location of houses and streets to avoid building houses on the poor soils, we almost automatically reserve the other soils for trees, playgrounds, and nature-study areas. Many kinds of soil highly suitable for summer-growing crops are too wet in winter for housing and accordingly are better used for farming.

People concerned about maintaining high-quality outdoor playroom for youth see this as the most important long-run benefit of planning with soil surveys. The big need for recreational areas, with trees and shrubs and animals, is in the local communities where the boys and girls live, not in some distant park. Every boy and girl should have such a place within easy distance by foot or bicycle.

Provision for these areas need not be expensive. But if the bulldozers tear up these soils and houses built on them fail, the community has a costly and messy place instead. One can see how planning with the benefit of soil surveys works out in Lake County, Ill. Or he can see it around Charleston, S.C., or San Antonio, Tex., in Fairfax County, Va., and in many other places.

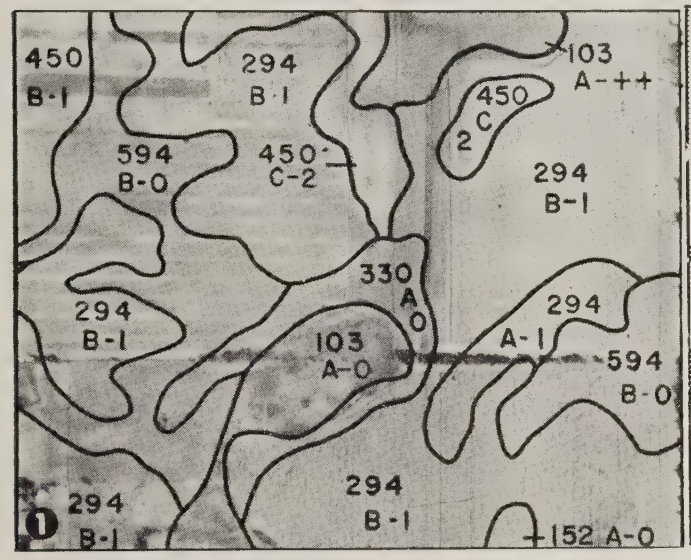
A person buying a home or a lot to build on should look closely at the soil or, preferably, have someone skilled in soil science do it for him. A little care can keep his "dream house" from going down the slope or the health office from condemning it.

Golf Course—Homesite Developer Revamped Plan To Fit the Land

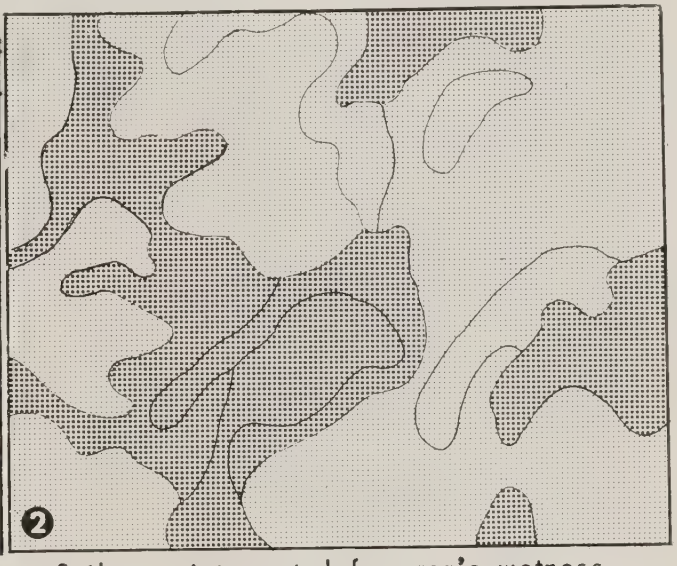
By Roy C. Anderson

LONG GROVE Country Club Estates is a 525-acre combination golf course and homesite development. My experience as a developer begins and ends with it. Nevertheless, it is a good example of a changing pattern of physical layout of new homesites in this northeastern Illinois locality as a result of more aggressive planning by local officials.

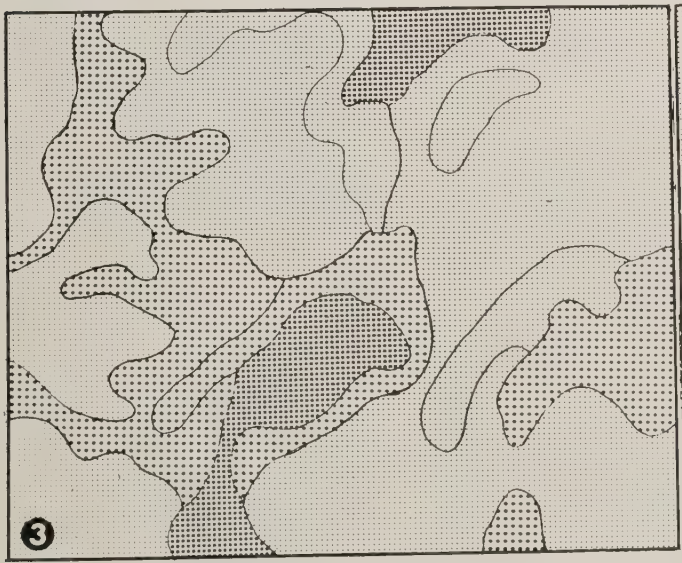
With the new emphasis on orderly urban and suburban growth, restrictions on subdividers are growing tighter, here in Lake



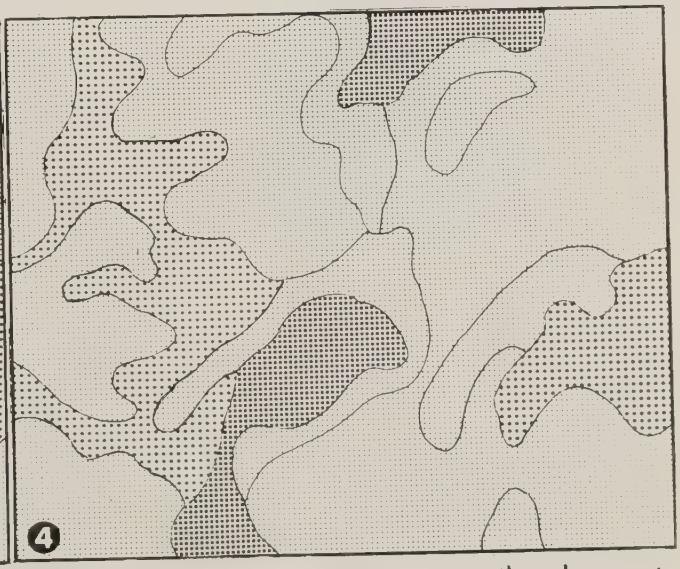
Map with symbols showing kinds of soil on 130-acre area of Long Grove Country Club Estates.



Soil map interpreted for area's wetness limitation for housing development: None to slight; severe.



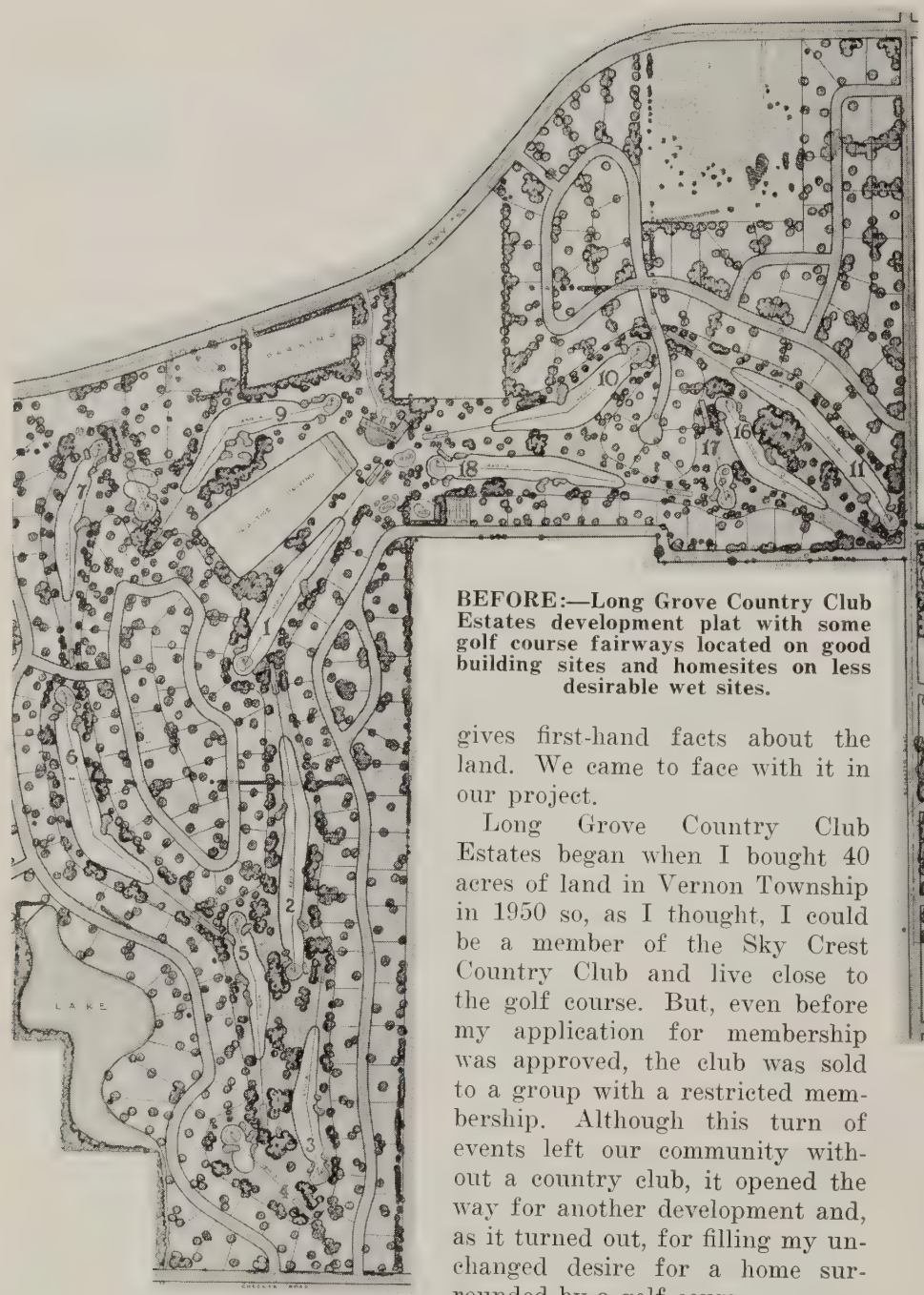
For its bearing strength affecting construction of buildings and roads: High; moderate; low.



For its limitations for recreation development Few; moderate; many.

(See cover and other pages.)

Urban-Area Soil Map Interpreted



BEFORE:—Long Grove Country Club Estates development plat with some golf course fairways located on good building sites and homesites on less desirable wet sites.

County as elsewhere. Zoning ordinances are being enforced, and many special requirements are being added in the public interest. Now a new tool is being made available to both developers and elected officials that will play a major role in the design and layout of future residential housing. It is the detailed soil survey that gives first-hand facts about the land. We came to face with it in our project.

Long Grove Country Club Estates began when I bought 40 acres of land in Vernon Township in 1950 so, as I thought, I could be a member of the Sky Crest Country Club and live close to the golf course. But, even before my application for membership was approved, the club was sold to a group with a restricted membership. Although this turn of events left our community without a country club, it opened the way for another development and, as it turned out, for filling my unchanged desire for a home surrounded by a golf course.

For a brief period I went into farming, buying additional land to make an economic unit. But after the cattle market broke in the early 1950's, I discontinued operations and rented the land to other farmers in the area. About 8 years ago, my dream of the present development began to form, and my last few land purchases were made to round out the acreage I needed for it.

The next step was to engage an architect to prepare a layout for the golf course and some "prestige" homesites. In doing so, I discovered that I would have to satisfy not only myself but the officials of Long Grove village in Vernon and Ela townships.

It was my idea to break the land that would be set aside for homesites into about 1-acre lots. However, my development had to be laid out in detail and approved by the village before I could employ a professional planner. So I had an architect draw up a plat—which seemed to me to be an excellent layout—and took it to the village board. This was before either the architect or I knew that a soil survey had been made of nearby Ela Township.

The idea of 1-acre lots didn't appeal to the board. They were skeptical of such a marked deviation from their Long Grove zoning rules which called for 2- and 3-acre lots in this location. In negotiating with them, I tried to show that the crux of the matter really was the density of housing for the total project. There were to be 150 to 160 acres of open land in the golf course and about 30 acres in dug lakes. My home takes out 17 acres, leaving 271 housing sites in the 525 acres.

This arrangement didn't con-

The author is developer of the Long Grove Country Club Estates, Long Grove, Ill.

AFTER.—The new plat with these locations reversed when surveys showed almost as many (271) sites suitable for homes without sacrificing golf course. (see cover and p. 107).

rince the board, either, as they vere afraid of water and septic ank problems. One member called ttention to water tables in the rea and proposed that I check vith the local Soil Conservation Service office to find the best build- ng sites—not wait until the land iad been developed before dis- covering the mistakes. And this is the way we got introduced to the Ela Township soil survey.

When we showed our plat for the Long Grove County Club Estates to Work Unit Conservationist Elmer Offerman, the first of several faults in it showed up before we had studied the soil survey map for the area more than a few moments.

For example, we had planned a number of building sites in an area with soils which have a perennially high water table. We would have had structural support problems with the foundations, flooded basements, and septic tank failures—all in one package. Added to these problems would have been the poor growth prospects for the kinds of trees and shrubs we wished to be planted. Another thing, we wanted lakes for the people living there to enjoy. Further study revealed that this part of the area was a promising site for an additional lake.

By that time, we began to realize it would be necessary to change the plat. Then we learned that some of the fairways for the golf course were planned on excellent building sites, while some of the lots adjacent to these fairways were planned on less desirable construction sites. In developing our revised plat, we simply reversed these locations.

Another serious mistake we almost made was in locating some of the streets. The original plat had streets planned in areas with depressional and organic soils that undoubtedly would have caused complex and costly construction and maintenance problems. In order to build durable roads where we had planned them on the original plat, it would have been necessary to remove the poor material and backfill with more stable material. Even if this had been done, the excessive ground water in the adjacent area would have caused continuing stability problems.

And so it went. The soil survey map was useful to us in many, many ways as we drew up a different plat. And, in the end, we had so many plus factors that we won the village board's approval. One of the most convincing was our willingness to make a completely new plat for the area, with golf course and homesites laid out to fit the land and the soils.

Without the use of the soils information, it is altogether possible that the future "dream homes" of some folks in Long Grove Country Club Estates might have been turned into nightmares of septic-tank and water worries. Such a situation wouldn't have been good for the golf course enterprise,

Developer Anderson (l.) and Chicago Architect Robert Bruce Harris go over plans for homesites and golf course.

This inviting golf course is at Barrington in Lake Cuba Township.

either, because most of the membership for the country club likely will come from the estate residents. Those are some of the reasons we are happy with the way the whole venture is turning out.

Health Official Says Soil Survey "One of the Most Useful Tools"

By John G. Morris

THE U. S. Public Health Service's committee on environmental health problems pointed out in its 1962 report that population growth with the greater concentration of people in urban areas has aggravated environmental problems in two related ways. First, quantities of air, water, and land resources available to each individual are being reduced. Second, the increased amounts of waste products are bringing even greater increases in their effects on people.

In Lake County, Ill., on the fringe of Chicago's burgeoning metropolitan area, we are especially conscious of these problems. We know we must use all the scientific knowledge at hand and maintain constant vigilance to give our people clear air, pure water, healthful food, and comfortable shelter.

In the search for ways to meet the challenge, one of the most useful tools we have found is the information in soil survey reports. Due to the nature of Lake County soils and the many depressional areas in the topography, water management, sewage disposal, and pollution can be major problems. Interpretation of soil facts related to these problems often provides the key to wise decisions.

Author Morris (r.) and Elmer Offerman of SCS examine soil sample indicating an "unbuildable" wet subdivision lot.

Development of rural land beyond the limits of community water supply and sewage disposal facilities puts the burden for providing these necessities on subdividers and individual home builders. There are more than 25,000 individual sewage disposal systems in Lake County. The Health Department gets approximately 800 new requests each year for approval of septic tank installations.

The standard procedure on such requests has been to conduct soil percolation tests as developed by the U. S. Department of Health,

The author is sanitary engineer, Lake County Health Department, Waukegan, Ill.

Education, and Welfare. This test calls for determination of a site's suitability, by measuring the rate of water-level drop in minutes-per-inch in six test holes which have been presoaked for 4 to 24 hours.

The Department's experience indicates that the percolation test method has shortcomings. Among them are:

(1) Inability to recognize soils subject to intermittent high water tables.

(2) Inability to recognize an abnormal soil condition, such as dry-weather cracks, root channels, and worm holes, that cause percolation rates not representative of the soil area as a whole.

(3) Low confidence possible in the percolation rate established by the test, because each site must be treated as an individual and distinctly separate situation rather than as a representative site.

(4) Expense of the testing procedure—high for both the inspecting agency and the owner of the site.

(5) Dependence of the test on weather conditions, with interference from freezing weather and rain.

In an effort to improve on the existing test procedure, the Lake County Health Department and the Soil Conservation Service cooperatively studied the use of soil maps as a means of determining soil suitability for individual soil-absorption sewage disposal systems. The SCS prepared a soil map for Ela Township, and similar mapping is now being done throughout the county.

There is enough homogeneity in soil types mapped to permit the making of predictions about soil behavior. A comparative analysis of the results of percolation tests and laboratory hydraulic conductivity tests (Uhland core method) indicates that any particular soil type consistently performs in a similar manner for both of the tests.

In light of this favorable comparison, a statistical analysis of the Lake County Health Department's test data was made on seven selected soil types. The analysis indicated that after sufficient tests (30, with 6 percolation runs at 5 soil sites) were averaged, a percolation rate could be assigned to a soil. A Health Department staff member then reviewed septic tank installations in areas where the soil type had been established. It was found that those soils having satisfactorily predicted percolation rates were providing satisfactory performance after at least 1 year of use.

As a result of our studies, we were able to sum up the following advantages from use of soil maps:

(1) Interpretations of the soil-mapping unit will indicate whether the soil at a particular site is subject to an intermittent high water table. This will avoid the criticism of variability of the percolation test rates, resulting from the tests' being conducted during different seasons of the year.

(2) The suitability of a site can be based on the performance of the soil type at five, or probably more, other site locations instead of merely the six test holes on one site. By this method the confidence limits would be improved from 30 to 95 percent.

Newly excavated basement filled with water from high water table.

One of 3 lakes developed on wet Class V land in Lake County's Hawthorn Woods subdivision for swimming, fishing, and winter sports.

This septic tank failed because of soil conditions, and fluid comes to surface below filter field in foreground.

(3) The use of soil maps will permit the determination of site suitability for the correlated soil types regardless of the time of the year at which the request for determination is made.

(4) Presently, the cost to the property owner for a percolation test varies from $35 to $75. Assuming the average size of a homesite to be ½ acre, the cost of determining the site suitability is presently costing approximately $100 an acre, as compared to 30 cents an acre through the use of soil maps! In addition, soil maps provide much additional valuable information not gained through the percolation test.

The use of soil maps will not provide a panacea for the problem of determining site suitability for soil-absorption sewage disposal systems. The method will be most effective in reviewing large land areas, such as an area proposed for new subdivision development. In the case of small individual lots, the scale of the soil survey may not allow accurate location. A lot located on a transitional soil area may require field investigation.

In the case of existing subdivisions, the natural soils may have been disturbed so that the soil maps may not be accurate. In the case of proposed subdivisions requiring a considerable amount of site stripping and grading, a large portion of the soil map would be invalidated. In other words, the soil maps reflect the natural soil landscape found at the time the maps were prepared.

As a result of progress made in getting reliable results with soil survey information, we have designated the village of Hawthorn Woods in Ela Township as a test village, in which permits for new septic tank installations will be granted on the basis of information in the township soil map rather than percolation tests.

We are making the transition away from percolation tests gradually, as our experience increases. We are currently taking photos of the soils map and projecting them on a county tax map. With a table of percolation rates, we can give an informed answer right on the spot.

There are many other applications of soil data to health problems. One of them is in the construction and maintenance of sanitary landfills. We had a good example not long ago. Pits had been dug very deep and used for borrow. Probably because of intermittent changes in the water table, the ground water came up, leaching the buried refuse. The odor, primarily of hydrogen sulfide, persisted for months and was almost unbearable. The pits were near several commercial buildings, and their owners complained bitterly of the effect on business. We have a system of review for proposed landfills; and with the soils information, we now have another valuable tool to help with our decisions.

Location of sewage lagoons offers another application of the soils information. Even if the percolation is such that there is danger of leakage into surrounding soils, knowledge of other soils in the vicinity sometimes makes it possible to bring in impervious material from a nearby source to act as a sealer.

In Lake County, wells are the principal source of water supply. With a rapid percolation rate near septic tank installations, they have easily become contaminated, particularly where there is a high water table.

Proper location of sewerlines is also important, and stability of the soil is one of the factors. If there is settling, the gradeline is interrupted.

Lake County is famous for its Fox Lake and the chain of lakes that continues into Wisconsin. This is an area where better understanding of the nature of soils, erosion sources, pollution sources, algae production, and their interrelationships could have a tremendous effect. Recreation is a big business here, but its future is threatened by lack of knowledge of health problems and a need for cooperation.

In my opinion, soils evaluation can make a signficant contribution in improving the urban environment, particularly if used early in

the evolution of the home and industry pattern. Many things go into consideration of the total health and welfare of an individual or a city, and making any choice usually involves a compromise. Factors include economics, esthetics, public convenience, availability, and physical suitability. The best choice can be made when all factors involved are recognized and information is readily available on which to base judgment.

Soils facts are a source of help we can't afford to ignore.

Urban Growth Spurs Planners To Look for Basic Land Facts

By Frank S. So

PRACTICAL considerations are causing urban planning agencies and public officials throughout the Nation to make increasing use of soil surveys. Faced with a growing urban population that is turning farms into residential subdivisions, shopping centers, and industrial districts, the planner needs information about the basic resource being consumed—the land.

The use of soil information by officials interested in guiding urban growth follows somewhat the the same historical sort of development as happened in the use of topographic information. In the past, developments were planned on a rectilinear block pattern without regard to topography. Now streets and lots are arranged so as to follow topographic lines (the agricultural equivalent of contour plowing). Similarly, the planner now sees that the character of the soil also makes a difference in how land can be developed.

What are some of the urban development problems that can be eliminated or lessened through the use of soil surveys?

Perhaps the key problem is related to sewage disposal. Urbanization has taken place so fast and in such a sprawling pattern that

Author So includes soils information in dictating planning report to his Chicago office.

the septic tank has become a part of the American way of life. Unfortunately, the septic tank's leaching fields are clogged too much of the time in too many locations. Hand in hand with the septic tank problem comes the pollution of underground water sources that supply domestic wells. Inefficient sewage disposal methods have also polluted many small lakes and streams. Other areas are plagued by flooded basements, standing water that becomes stagnant, cracked foundations, crumbling driveways, eroding slopes, or yards in which neither grass nor trees can grow.

In many of our communities, local roads periodically crumble because of subpavement earth slippage. Even portions of major highways have had to be rebuilt because of poor soil conditions. Other highway projects have been delayed for long periods, while costs have soared as piling or retaining walls were suddenly found necessary across stretches characterized by subsoil instability.

Similarly, the foundations of public buildings have failed, and underground utilities have been corroded. Haphazard development of upstream areas has contributed to damaging floods at downstream locations.

Of course, many such problems are of an engineeering nature and cannot be completely solved without detailed onsite study. Although urban planning operates on a more general community- or region-wide basis, it is possible to predict in advance where problems are likely to occur. In terms of a comprehensive planning program, the soil survey falls into the category of basic studies that precede planning, such as studies

The author is senior planner, American Society of Planning Officials, Chicago, Ill.

Homeowners learned too late this Lake County land was subject to flooding. Soil survey information could have led them to higher ground.

of population, economic character, existing land use, and the physical setting of the community. The soil survey falls into the last category of basic studies and is related to studies of the natural environment—terrain, drainage patterns, water supply, climate, and the like.

In the past, soil information was not used to a great extent, because many of the maps in earlier surveys were made on a small scale and were not interpreted for urban purposes. Today, this is not the case. The Soil Conservation Service has been steadily increasing its interest in urban-growth problems, and the result has been a speedup of surveys for which it is responsible in areas experiencing urban growth as well as developing more urban-oriented interpretations. Planning agencies have been vigorous in using the information.

The following are only a few of the examples of work that is being carried on in different parts of the country:

The Northeastern Illinois Metropolitan Area Planning Commission published a soils report based on generalized maps as one of its first studies after its establishment. The information has since been used to advantage in subsequent work, such as planning for refuse disposal sites and open space for recreation. In addition, one of the member counties has been working very actively with SCS officials in detailed soil mapping.

The Southeastern Wisconsin Regional Planning Commission, covering a 7-county area, has felt that soils information is so important in its planning program that it has contracted with the SCS to place additional men in the field in order to complete surveys in time to be of use in planning land use, transportation facilities, utilities, and other community facilities. Almost 40 percent of the land area has been covered with detailed soil surveys, but entirely new surveys will be needed on about 1 million acres.

The Tri-County Regional Planning Commission in the vicinity of Akron, Ohio, has published a report based on both general and detailed maps, as has the Stark County (Ohio) Regional Planning Commission. The Penn-Jersey Transportation Study is experimenting with soil suitability ratings based on soil surveys which will be used as "inputs" in the construction of a "regional growth model." On the west coast various planning agencies in the Puget Sound region are using soil data to forecast land use, as useful information in zoning and subdivision control, as well as for use in public health controls.

Numerous additional planning agencies could be added to this list, from Texas, Michigan, Ohio, Virginia, Kentucky, Florida, and some New England States. Why should these groups be so enthusiastic about the new soil surveys that are being made? Perhaps the best answer is that such information has been needed for some time to solve planning problems, and the SCS, in cooperation with urban planners and construction engineers, has been engaged in efforts to interpret basic soil data for urban land-use suitabilities.

Any planner glancing through a modern detailed published soil survey with urban interpretations will be quick to grasp the potential of such information in a planning program. He will see that a great deal of work has been done in adapting soil information for land-development purposes. The soil maps are extremely legible, with fine lines superimposed over high-quality printed aerial photographs, on a scale that would make neighborhood-size site review possible.

The modern soil survey has information about the major kinds of soil that occur in the area, with descriptions of their structure, texture, and other physical characteristics. Information, measurements, estimates, and interpretations are then presented for a host of characteristics including, but not limited to:

Porosity and percolation rates, drainage, ponding, flooding, runoff, depths to bedrock and water tables, bearing strength, shrinkage and swelling, corrosion, frost action, and erosion. These characteristics are then translated into suitability ratings (e. g., most

favorable, very favorable, favorable, somewhat favorable, unfavorable) for various land uses such as low or high density residential, industrial, commercial, transportation, and developed and undeveloped recreational areas.

It doesn't take very long to see that soil surveys not only can give the planner information about which areas will be suitable for the use of septic tanks, but are useful in answering such varied questions as: Should a particular piece of open space be developed as a camping area or a golf course? What areas should be avoided in laying a new trunk sewerline? Which areas would be most suitable for industry? What areas present problems for any kind of urban development? If we do not have flood records for certain streams, how much do we know about the flood potential of adjacent land?

These kinds of questions and arguments for the usefulness of soil surveys in an urban planning program have been well summarized in a staff memorandum of the Southeastern Wisconsin Regional Planning Commission. It states that a soil study is being conducted which can be used to:

(1) Aid in selecting and developing desirable spacial distribution patterns for industrial, commerical, agricultural, residential, and recreational development.

Timberlake subdivision developer located Wauconda Township homes on high ground and lake in low area. Soil surveys guide similar good planning.

(2) Make preliminary estimates of the engineering properties of soils that will aid in selecting highway, railway, airport, pipeline, and cable locations, and in planning detailed soils investigations for route location studies.

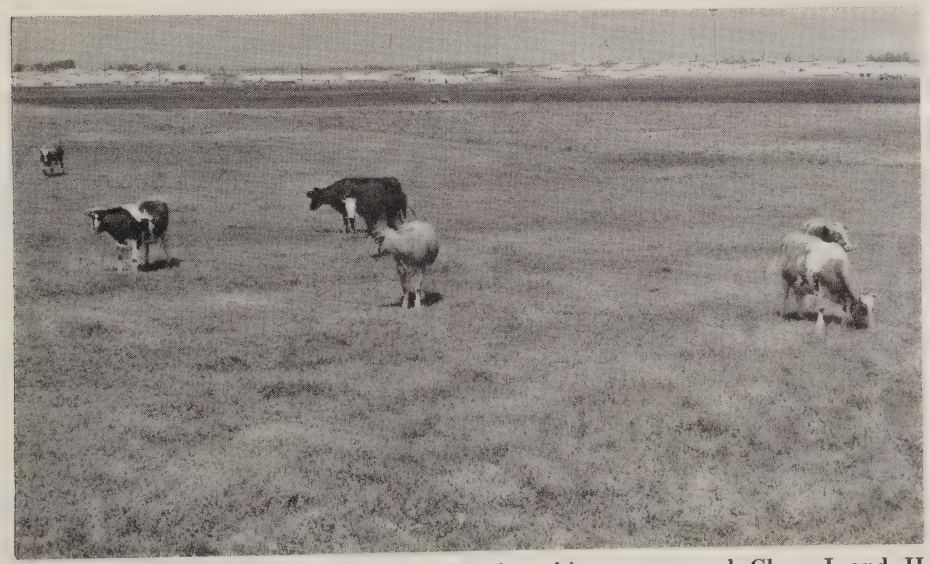
(3) Make preliminary estimates of the agricultural and natural wildlife relationship properties of soils that will aid in planning for the reservation of permanent agricultural and recreational green belts and open spaces.

(4) Make preliminary estimates of the suitability of soils for private sewage disposal facilities, agricultural and urban drainage systems, foundations for buildings and structures, including transportation facilities, and water-storage reservoirs and embankments; and make determinations of the need for soil and water-management practices such as erosion control and drainage required in connection with planned development.

(5) Locate potential sources of sand, gravel, and other mineral resources.

(6) Correlate performance of engineering properties with kinds of soil to develop information for broad, area-wide land-use planning.

By almost any standard of measurement, a good start has been made toward increased joint efforts of soil scientists and urban planners in working together in providing information that is important and useful in guiding and shaping urban growth. With the kind of knowledge about the land that is now being developed, urban planning and development decisions can be made on a sounder, more rational basis.



This is how metropolitan-area housing is taking over good Class I and II farmland in Cook County around Chicago and in the environs of other cities.

Conservation District Program Serves Rural and Urban People

By Elmer E. Offerman

SWCD Secretary Henry Schaeppi (r.) and Author Offerman consider other uses for peat area not recommended for home building.

EACH day brings a new problem and a new opportunity for me as a work unit conservationist of the Soil Conservation Service to be of assistance to a wide variety of users of land and water resources in a rural-urban county.

Our Lake Zurich work unit comprises Lake County and part of Cook County, Ill., in the Chicago metropolitan area. The area is experiencing urban expansion. As a result, we in the work unit office and the SCS area office in Kankakee are working with officials on all levels of government—village, township, county, intercounty, and metropolitan. The type of information and help provided varies, because each unit of government has its own responsibilities in the field of planning and zoning.

The Lake County Soil and Water Conservation District was organized in 1958. It was one of the last to be formed in Illinois, because some people thought there was no need for such a district in our county, as it soon would be all covered with houses, factories, and shopping centers. Others said: "Why organize a district? It's only for farmers."

The progressive leadership of the county realized, however, that while it is in the metropolitan area, it is still primarily an agricultural county. Nearly three-fourths of the land is still in agriculture or other open-type use. The sale of scattered farms for urban purposes tends to excite local residents, but does not mean that agriculture is doomed.

The belief that a soil and water conservation district is only for farmers likewise has been proved wrong, as we are providing significant services to both agricultural and urban interests. The Lake County district's board members have developed a program that recognizes their responsibility to help all land users. Their objective is the best use of each and every acre of land, in urban as well as rural areas.

They also were aware from the start that urban development would not be as rapid and land-consuming as some promoters would like everyone to believe. One member of the board remembers the experience of his own family, who sold the home farm in the late 1920's, only to see just such a promoter's grandiose plan fade. After the family repossessed the land, they had the novel experience of farming around fire hydrants and waterlines. This farm finally was sold again, in 1960, for urban development.

The board also realized that soil erosion on urban land contributes to siltation of reservoirs, streams, and lakes and that runoff helps create flood problems. It accordingly has made available, any information it has that zoning officials, planners, and others can use to solve or prevent their land-use problems.

Interest was developed among urban leaders by means of a tour held in the fall of 1959 for the Commissioners of the Lake County Regional Planning Commission, the chief sanitary engineer for the Health Department, district directors, and SCS personnel. On this tour, we studied soils subject to flooding, soils impervious to water, high water-table soils, and those which have poor bearing strength for structures.

The chief soil problems growing out of these varied soil conditions in our urban community include: The individual home septic system which fails to function in the spring of the year; homes with the basement full of water; and entire subdivisions which have been flooded, requiring evacuation of the residents. Also, many homes with cracked foundations and walls, and roads which have become nearly impassible because of poor soil conditions affecting their construction and maintenance.

These problems have become our challenge, and we are making some progress with them. John Quay, chairman of the Ela Area Planning Board, took the initiative and contacted my office the afternoon after the tour. Based on his visit and several followup meetings, we developed a cost-sharing arrangement for mapping the township's soils. The cost of the fieldwork was shared jointly by the Lake County Health Department and the Lake County Regional Planning Commission. Cost-sharing was necessary, because this was a speedup program beyond the normal load of district cooperators' request for soil surveys.

The author is work unit conservationist, Soil Conservation Service, Lake Zurich, Ill.

The field mapping, completed in 1960, was a standard soil survey; but soil scientists sensed the importance of the pilot project and were especially alert to conditions which would have influence on urban living and use of the land. The fieldwork was followed with a series of discussions and meetings, at which time an interpretation report was developed. It was presented formally to the County Board of Supervisors and interested organizations in an afternoon meeting on March 15, 1962. Some 100 local residents heard an explanation of the report at an evening meeting in Ela Township.

Even before this report was rereleased, adjoining Vernon Township signed an agreement to have its entire acreage mapped on a cost-sharing arrangement. The pioneering activities of these two townships focused attention on the use of soil information as a basic guide to urban planning. The County Board of Supervisors was among the first to recognize its value, and on January 1, 1963, developed a cost-sharing agreement with the SCS to complete soil mapping of the county by 1966. A total of $24,000 has been contributed for cost-sharing soil surveys in Lake County.

Lake Couny SWCD Board must solve many knotty urban problems as well as farm conservation problems, because of district's proximity to Chicago. L. to r.: —Paul Waters (SCS), Stanley Faulkner, Chairman S. Burton Lee, Henry Knigge, Arthur Bucher.

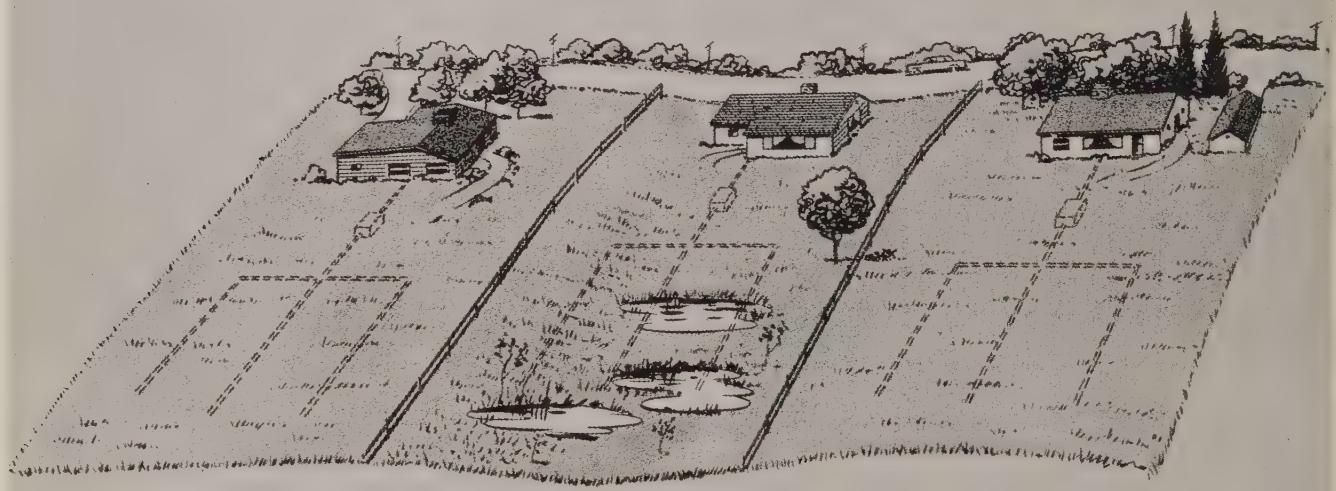
Requests for SCS and district help increase as the soil information is made available township by township. The assistance given the Long Grove Country Club Estates is one example. The contacts we had with this development resulted in basic changes to the layout. The soils information was interpreted for the developer so the problem areas could be readily seen. When this plat was finally approved by the village board, the land-use pattern of this more than 500 acres of land was set for many years, illustrating the fact that decisions that we are helping urban users make are not as subject to change as those on the agricultural land.

Many of our requests are handled on a consultation basis. Representative was a request for help on a 35-acre lake that the district handled by meeting with the owners and their private engineer. The needed survey information was obtained by the private engineer, and it was arranged for our area engineer to consult with him on the design. In another instance, a group of 12 property owners was interested in a preliminary report and feasibility study for a 150-acre lake. This report was made. Future engineering assistance will be obtained from a private engineer.

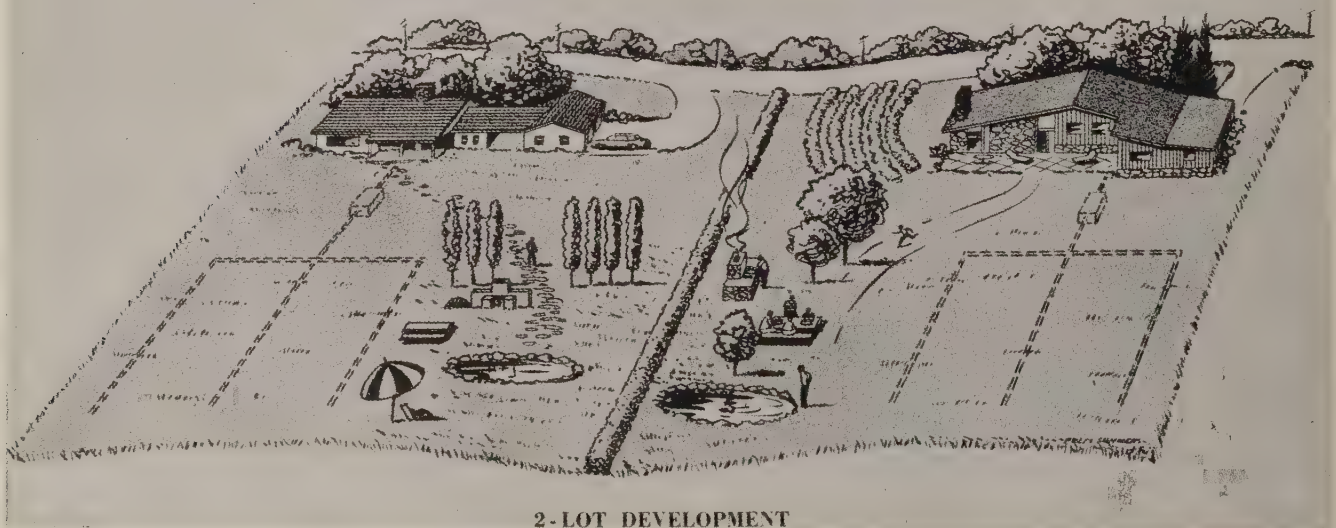
Our accomplishments in the use of soils information in the urban area have been due to the interest and understanding of local leaders and governmental officials. And it is in the communities where the local people are interested in high quality urban-area growth that we have experienced its most effective use.

Seriously eroded subdivision lots, where septic systems failed to work and property was allowed to run down.

UNDEVELOPED TRACT



3-LOT DEVELOPMENT



2-LOT DEVELOPMENT

2 for 3 is better planning.—Crowding homesites oftentimes cause septic-system and other problems, as in the 3-lot arrangement (center). Larger lots give owners more room to locate their filter fields and beautify their property (bottom).

SOIL SURVEYS 'MOVE TO TOWN'

By A. A. Klingebiel

KNOWING what kind of soil with which they have to work is of first importance to all manner of urban and rural planning and construction people.

In addition to farmers—for whose guidance soil surveys originally were developed—homeowners, construction engineers, planners, and a host of others have found they benefit from the use of modern soil surveys. The depth to bedrock or to a water table is equally important to a construction engineer in selecting a building site as it is in determining the kind of crops, grass, or trees to grow, or how to locate and build farm ponds, terraces and diversions, or other conservation structural works.

This and other information is brought out in the soil surveys, which are drawn upon in soil and water conservation districts' farm and ranch planning, in planning and construction in small-watershed protection and flood prevention projects, and in urban-area development. In urban-area use, for example, the surveys disclose soils that are slowly permeable to water or those that are subject to overflow and have severe limitations for use as homesites as well as for growing many kinds of plants.

Wet-area cattails—Nature's warning to check soil surveys before building!

These facts about soils can be learned from soil maps made through the National Cooperative Soil Survey and published by the Soil Conservation Service of the U.S. Department of Agriculture. In the early work in soil survey, soils were mapped, described, and studied to find out how well they were suited to different crops, and how each kind of soil should be treated to get a sustained yield. The benefits of this work soon reached beyond the farmers. Today, some of the most enthusiastic users of soil maps are engineers, planners, and local officials responsible for suburban developments and highway construction.

Fortunately, this new use of soil maps was made possible by the increasing demands of farmers. Modern farming requires more and more detailed soil maps and more precise interpretations of the way each kind of soil will perform. The soil properties that affect agricultural uses are the same ones that affect the suitability of the soil for urban uses.

The same basic principles that made our agriculture so productive can be applied to urban areas equally well. The interpretations are different; but they go back to the same basic principles of soil physics—water movement, shrink-swell potential, susceptibility to erosion, and other properties. In either case, our first job is to know the kind of soil, and then to make the interpretations for the intended use. Thus, the modern soil maps, though prepared primarily for farmers, can be interpreted for suburban planning, soil engineering, and for many other uses. Today's soil surveys are designed to meet the needs of the many users.

In making the maps, the soil scientist walks over the land, studying the soils, vegetation, and other features of the landscape. He identifies the different soils by digging numerous holes and examining the different layers of soil, usually to a depth of 5 feet. Using his knowledge about soils and their behavior, he classifies the different kinds of soil and records their boundaries on an aerial photograph. A separate symbol is used to identify each different kind of soil, which is described in terms that have special meaning to soil scientists.

The properties of each of the soils are compared with those that have been described and named in the national soil classification system. If the soil does not differ significantly from one already classified, then the soil is given the name of that classified soil. If the soil is unlike all others classified to date, it is given a new name. A uniform system of soil classification is followed in the United States, so that all soils that are alike have the same name.

By recording the behavior of the

Structural failures like this in buildings on unstable soils are costly for homeowners.

The author is director, soil survey interpretation, Soil Conservation Service, Washington, D.C.

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different kinds of soil, we can assemble useful data about each of the soils that is named and classified. Some of these data are obtained from carefully controlled experiments conducted in the laboratory or in the field. Other information is obtained from the experiences of farmers, engineers, and others who work with the soil. Through the use of a soil map, this information can be applied to other areas having the same kind of soil. In this way, experience and experimental data gained in one area of a named soil can be conveniently extended to another area of the same kind of soil.

Soil maps are made at varying degrees of detail according to the intended use. A general soil map can be made quickly to show only the main patterns of different kinds of soil as they occur in large segments of the landscape. On such a map, planners can pick out large areas of soil subject to flooding or of questionable suitability for sewage disposal or foundations. These maps normally cover a county or township; nevertheless, many questionable areas or problem areas will show up in areas as small as 300 acres. They are useful for broad general planning purposes.

The detailed soil map, usually at a scale of 4 inches to the mile or greater, separates different kinds of soils in areas as small as 1 or 2 acres. The delineations on a survey of this kind reflect differences in soil texture, structure, acidity or alkalinity, thickness,

Lawrence Benson, now WUC at Geneva, examining Ogle County soil for recording on aerial photo that became soil map of area.

permeability, moisture capacity, and many other properties significant in detailed urban planning. Soil maps at this scale are accurate to within several acres, but it is not feasible to show the precise boundary of each kind of soil. It usually is advisable to make some onsite evaluations before construction sites are finally selected. These maps are suitable for operational planning.

A detailed soil map can serve the urban planner as a blueprint of the land. It will help him in making wise choices among alternative uses, and assist him in resisting pressures from those who have short-term objectives or are poorly informed. The soil map can be interpreted to show the soils that are good sites for roads, private dwellings, schools, septic fields, commercial areas, parks, and other urban facilities. It shows, also, soils not suited. But the soils ill-suited to homes, schools, or other buildings well may be suited as sites for parks, golf courses, wildlife sanctuaries, plant nurseries, or agricultural crops.

Soil maps have been published for more than 2,000 counties and areas. Our knowledge about soils and their management has increased rapidly in the last 25 years. Consequently, the recently published soil surveys contain detailed soil maps and specific interpretations for many different users.

Soil mapping is now going forward, or has been completed, in approximately 2,940 soil and water conservation districts that take in nearly all farms and ranches of the 50 States, Puerto Rico, and the Virgin Islands. In 1962, about 60 million acres were mapped. More than 1,500 trained soil scientists carry on this work.

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Soil Conservation

SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

VOL. XXIX, NO. 6 JANUARY 1964

OUR SOIL ★ OUR STRENGTH

Soil Conservation 25 Years Ago

"Added responsibilities recently assigned by the Department of Agriculture broaden to some extent the horizon of the Soil Conservation Service. New activities consist of drainage, water facilities, irrigation, submarginal land acquisition and development, and upstream flood control. . . .They provide additional methods of treatment to achieve proper land use.

"As the Service will be benefited by these activities, so also will the activities themselves be benefited by increased scope and by integration with other activities to secure a fully coordinated conservation program. For instance, an action program for flood control may embrace application on a watershed basis of most of the conservation features already developed. Soil improvement practices will be required to decrease runoff; flood retardation by vegetation and structures will be necessary; the reestablishment of vegetal cover over critically eroding areas will be essential as a method of silt control; channel improvement and protection, highway erosion control, and gully control over the watershed, all will enter in the picture."

COVER PICTURE—Secretary Orville L. Freeman and Assistant Secretary John A. Baker discussing stripcropping applied, with Agricultural Conservation Program cost-sharing, on steep slope on Melvin Simons' 844-acre small grain and livestock farm in Walla Walla Soil Conservation District, near Walla Walla, Wash. Simons has been a district cooperator since 1945.—Photo by Roy Clark.

CONTENTS

Page

123 Conservation Planning Shaped to Broadened Needs
By Val W. Silkett

126 Conservation Fills Coloradan's Income Needs
By Lynn R. Healey

127 Planning Brings Community Cash—Better Living
By Gordon Gibson and C. R. Patton

128 Colonial Town Uses Soil Survey in Planning
By Bernhard A. Roth

131 "Hi Neighbor!" Company's Key to Recreation—Jobs
By Chester Bellard

132 Excerpts from "A Place to Live," *The Yearbook of Agriculture*
By Orville L. Freeman and John A. Baker

134 Community Watershed Dam Helps Cut Fire Insurance
By R. M. Dailey

135 First Conservation District Farm Plan Marker

136 Cropland Conversion Boon to Hunters and Fisherman
By Hugh Tidwell

137 Klubert Warenbourg—*A Profile*
By Ralph Shipp

138 Orchardist Brothers Combine Conservation—Marketing
By Garland J. Kidd

139 North Carolina Tobacco Growers Like Tall Fescue
By W. W. Stevens

140 District Cooperator's Movie Shows How to Build Pond
By R. R. Kirby and J. W. Gilliam

141 Right Equipment Helps District Do Efficient Job
By Ben Mace

142 Irrigation Farmers Restore Alkali Lands
By Norris A. Mathey

143 Book Reviews

Soil Conservation

ORVILLE L. FREEMAN
Secretary of Agriculture

JOHN A. BAKER
Assistant Secretary for Rural Development and Conservation

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, July 25, 1963.

FRANK B. HARPER, Editor

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Today's Conservation Planning Is Shaped to Broadened Needs

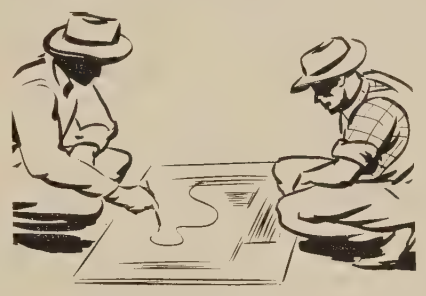
By Val W. Silkett

RAPIDLY growing needs for land space and for water have given new and vastly broader proportions to conservation planning for the use of these related resources.

Multiple use—multiple use of land, water, forests, and grasslands for agriculture, industry, recreation, and more satisfying community living—is a compelling factor in today's adjustments of growing urban and shrinking rural populations. Planning authorities at all geographical levels accordingly are directly concerned, from metropolitan area planning bodies to farmers' soil and water conservation districts. So are all local, State, and Federal sources of technical, financing, or other facilities that may be used by those who own or control these land and other resources for their own and the public's greater benefit.

With agricultural lands being converted at the rate of more than 1 million acres a year to nonagricultural uses to meet the demands of our ever-growing population, countless areas over the country present complex problems to those charged with responsibilities in the development and conservation of individual and community physical and human resources. Soil and water conservation districts, covering 93 percent of the country's farm and range lands and 97 percent of its farms, are in the forefront among them. So are agencies like the Soil Conservation Service, which provides technical and other help to the districts, to small-watershed protection and flood prevention project organizations, and to others carrying out rural areas and rurban developments and other land-use and water-management undertakings.

When the national soil and water conservation movement was getting under way some 30 years ago, the recognized land and water problems were confined almost entirely to individual farms and ranches.



Soil erosion control practices, through agreements between the landowners or operators and the Government, were applied on scattered farms in cooperatively selected demonstration projects set up in major agricultural areas of the country. These relatively simple measures, based on studies begun a few years before at several special erosion control experiment stations, consisted largely of gully filling or sloping, check dam building, contour plowing and planting, and a few other simple practices.

When it soon became apparent that full effectiveness of nearly all erosion- and water-control practices depend upon using them with other conservation measures needed to meet varying soils, climatic, and other conditions, the conservation plan came into being as a guide to treatment of lands with all kinds of soil and different uses. The land-capability interpretation of soil surveys—which is becoming increasingly important in all kinds of land-use and water-management planning today—also was evolved. It groups all soil mapping units into eight broad classes on the basis of soils, erosion, climatic or other hazards to agricultural production or other use.

The way also was paved early for the extensive planning techniques that were to become so essential in today's multipurpose conservation undertakings. It was found, for example, that to handle some common local water management and other problems adequately called for two or more farmers' working together with an overall plan. In soil conservation districts, which farmers and ranchers began organizing under State enabling acts in 1937, conservation farm planning tended to be grouped in small community areas or local watersheds according to priority of their problems.

But even with extensive conservation planning in cooperation with individuals and groups of individuals, it became clear that a farm-by-farm approach to the country's soil and water problems was not the whole answer, any more than had been the initial practice-by-practice approach. It was the 1954 Watershed Protection and Flood Prevention Act (Public Law 566), authorizing local-State-Federal cooperation in community-type projects on small, or creek-size, watersheds, that opened up today's new era of conservation

The author is director, Farm and Ranch Planning Division, Soil Conservation Service, Washington, D. C.

MULTIPLE-USE PLANNING.—Hoisery company built new factory adjacent to lake behind flood-prevention dam in Six-Mile Creek watershed project in Logan County, Ark.

PLANNING FOR WILDLIFE-RECREATION.—Fourth-season sericea lespedeza planting, 2,000 feet long and 15 to 20 feet wide, for wildlife food and cover in Dinwiddie County, Va.

URBANIZATION PLANNING.—New subdivision on good Cook County, Ill., farmland (farm buildings in background) brings its own conservation land-use problems.

planning. That is, by protecting sizable areas within a watershed with conservation land treatment measures, by dealing with relatively large numbers of rural or urban people economically or otherwise concerned with the watershed protection or flood prevention objectives, and by planning with them for multiple use of the watershed's interrelated soil, water, and plant resources.

Perhaps most important was the awareness that came of the impact which full resource development and use could have upon the people in a rural community and upon its economy. Here, conservation plans for individual land units fit smoothly together into the overall watershed plan to achieve common objectives of watershed protection, flood prevention, wildlife and recreational development, or agricultural, municipal, or industrial water supply for rural area development.

Now, also, especially in the New England and other States with major population concentrations in metropolitan areas, help goes to part-time farmers or to rural-urban residents. This "consultive assistance" usually is provided where special interpretations of soil surveys and conservation engineering skills are needed. Many planning bodies and local or State governments request and help pay for soil surveys used in such local planning. Such consultive planning help can be as effective as direct farm conservation or watershed planning, if it is timed so as to prevent conservation problems from occurring. For example, it is difficult for a soil scientist to be helpful with soil interpretations of permeability where houses already have been built and it is found that the septic tanks won't work!

The Rural Areas Development concept of bringing land, water, and people into a single development effort for community improvement has further served as a base for the Department of Agri-

culture to move ahead into two major new areas of conservation planning: One is income-producing recreation on rural non-Federal lands. The other is broad rural area and rural community planning for natural resources conservation and development.

The Food and Agriculture Act of 1962 provided authority for the Department to assist individuals or groups to develop income-producing recreational enterprises on their lands. This effort, under SCS leadership, envisions the full use of technical, cost-sharing, and credit facilities available from any agency of the Department. Amendments to the Watershed Protection and Flood Prevention Act at the same time authorized cost-sharing for recreation developments.

Basic to the adjustment in planning techniques to meet the needs for both income-producing recreation enterprises and recreation developments in watersheds is the recognition by technical specialists and the public alike that use of land for recreation is an agricultural land use, in the same sense as using it for pasture or woodland. Another essential concept is that of multiple use of land, water, and vegetative resources.

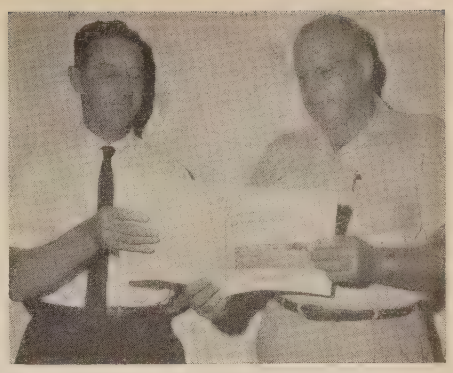
Perhaps the greatest challenge to conservation planning today is the new Department program of help to local groups in developing resource conservation and development projects. Such projects, of varying size and complexity of natural resource problems, are locally initiated and sponsored. They are intended to bring about the orderly development, improvement, conservation, and use of the natural resources of the project area. The ultimate goal is to provide people employment and other economic opportunities.

Slide of unstable soil caused crackup of house at Delmar, N. Y.

These projects will require an overall plan for dealing with resource problems and relating their treatment to the economy of the project areas. Also involved are detailed plans for action, ranging from conservation plans for individual farms or ranches to multipurpose watershed plans. Current conservation programs will be speeded up, through fullest coordination and concentration of local, State, and Federal efforts and facilities.

Planning for resource development on a broad area scale inevitably involves improved conservation planning techniques, as well as improved methods of evaluation that take into account the interaction between natural resources—fully developed—and the economy of the project area. We are fortunate in having many improved technologies and new authorizations available for this task. Thus a county-by-county inventory of soil and water conservation needs now has become an invaluable aid in resource planning throughout the country.

The Soil Conservation Service has shaped its planning procedures and its other operations to give technical assistance, in cooperation with other Federal, State, and local agencies and with private interests concerned, for economic development of soil, water, and allied resources for both agricultural and nonagricultural purposes. Orderly development of land and water resources and their highest use by people calls for careful, soundly based conservation planning, whether it be for a farm, a watershed, a county, a State, or a major river basin.



Mayor Rochester (l.) and Soil Scientist Huger S. Byrd study copy of Oconee County soil survey report.

Soil Scientist to Mayor

When Mayor S. Bruce Rochester of Walhalla, S. C., answers inquiries about Oconee County with information from the recently published county soil survey report he knows what he is talking about. He helped make the survey!

That was when he was still a soil scientist with the Soil Conservation Service and before he turned businessman and community leader at the county seat city over which he presides. His change in occupations has not lessened his interest, however, in soil surveys and other aspects of the soil and water conservation program carried on in the Oconee Soil Conservation District and the district-sponsored Coneross Creek small-watershed project.

Mayor Rochester had this to say:

"It is a foregone conclusion that this publication will be of invaluable use by farmers, agricultural workers, teachers, planning boards, chambers of commerce, business people, schools, and engineers, as well as by agencies of local and higher governments. I personally find it a very good daily reference book of useful information on varied subjects. In my job as Mayor of Walhalla, I am called upon to answer many inquiries from people outside the county and State who are interested in coming to Oconee County to live. Much of the information they request is contained in this publication."

Conservation—Not More Land—Fills Coloradan's Income Needs

By Lynn R. Healey

COLORADO Farmer W. D. Anderson's experience suggests that buying more land may not be the answer to increasing farm income. Instead, he thinks it will pay the average Colorado farmer to see first what he can do with a soil and water conservation plan on his land.

Anderson, who farms 640 acres near Collbran in the Plateau Valley Soil Conservation District with the help of his sons, Leo and Howard, has seen the net income from his own place go up and up. It now supports the elder Andersons, Leo, and the Howard Anderson family of four. He credits sound conservation treatment and management of his land with this achievement.

For example, leveling the row-irrigated cropland has led to uniformly higher and more certain yields. Irrigating the permanent pasture and hayland permits the Andersons to sell some of their feed, rather than buying feed for their sheep and cattle. Clearing 111 acres once covered with brush has increased grazing. They have installed nearly half a mile of tile drain for better use of 30 acres that stayed seepy much of the time. Improving the irrigation system also has saved on water and lightened their work.

Much of the Andersons' conservation work has been done with cost-sharing under the Agricultural Conservation Program. It has helped them make a sounder, more stable unit economically. They have been cooperating with the Plateau Valley district for 13 years.

Some of the soils on the Anderson place have not been easy to irrigate. Most, as shown by the soil survey information provided by the Soil Conservation Service, are heavy textured. They take water slowly. When they dry, they tend to crack; and with flowing water, the soil may wash. By adding manure and crop residue, and not letting the soil dry too often, the Andersons have overcome this problem to some extent. The improving texture of the soil now permits water to enter it more rapidly.

W. D. Anderson and son, Leo, with registered Hereford bulls.

Anderson says that for every dollar he has spent carrying out his soil conservation plan, there has been good return. Not only has conservation helped from a production standpoint but the value of the farm has been increased.

How much land would he need to support himself and the others under the older system of farming? At least twice the land he uses now, he says. And, even then, there would be much more work and almost certainly less dependable net income.

Anderson cattle thrive in well-managed irrigated pasture of mainly orchardgrass and red clover.

The author is work unit conservationist, Soil Conservation Service, Collbran, Colo.

Conservation Planning Brings Community Cash—Better Living

By Gordon Gibson and C. R. Patton

SOME 35 farm families in the long valley between Newman Ridge and Powell Mountain in east Tennessee's Hancock County are reaping cash and better living through conservation development of their picturesque Appalachian mountain country's natural resources.

In 1961, Robert Haston, county agent, and Elmer Turner, principal of Vardy Elementary School, helped the valley residents organize the Vardy Community Improvement Club. The next year President Willie Groshe of the new club asked the Hancock County Soil Conservation District for technical help in soil and water conservation.

Gordon Gibson of the Soil Conservation Service explained to the club how soils maps could be prepared for each farm and how each farmer might be helped in planning the use of his land best suited to the soil. The club decided to promote conservation farm plans in the county in cooperation with the soil conservation district. Fourteen farmers now have such plans, and others have applied for technical help.

The farmers were quick to adopt conservation practices to improve their property. They put in tile drainage, planted trees, improved their pastures, and planned forest fire control. Thirteen district cooperators are installing tile drains in the fertile and level, but poorly drained, creek bottoms. They will be able to use this rich land more intensively and thereby reduce hazardous row cropping and costly soil erosion on the steep hillsides along the narrow valley.

Vardy community nestles between Newman Ridge and Powell Mountain in east Tennessee's Great Valley.

Harold Williams figures on 2,500 pounds of burley tobacco grown after vetch-and-oats cover crop on 1.2-acre allotment.

The authors are, respectively, work unit conservationist, Sneedville, and area conservationist, Johnson City, both of the Soil Conservation Service, Tennessee.

The community improvement club also has helped to provide organized fire protection for woodlands, which make up 70 percent of the land in the community. Until recently, the area was burned over every 3 or 4 years. Of a total of 184 acres of tree planting planned, 30 acres have been set out. District conservation plans call for woodland improvement on 785 acres.

A milk route organized by the club brings in a cash income for many of the farmers in the valley. Improvements are being made to the school lunchroom, with labor donated. The valley road is being widened and stone-paved. Improved livestock and crop varieties are being adopted, along with better management practices.

By pooling their efforts, these people are making better use of their soil, water, crops, livestock, and woodland. They are pulling together the services of such helpful agencies and private interests as the Extension Service, the Soil Conservation Service, and the Agricultural Conservation Program; school and road officials, and business concerns.

Their "operation bootstrap" has brought them a new sense of purpose and security evident up and down the valley. Perhaps the best testimonial of all to the success of their resource conservation efforts is the fact that the young folks, who formerly were forced to search for work in other places, now are finding opportunities for prosperous and satisfying lives in their own community.

Colonial Town Uses Soil Survey In Planning for Today's Growth

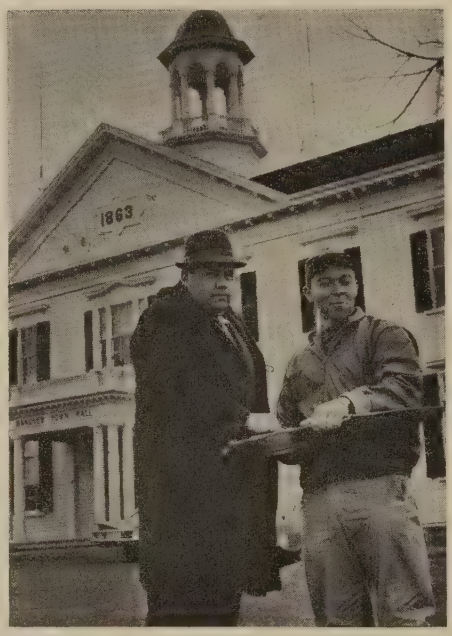
By Bernhard A. Roth

WHAT does a skilled consultant think of the usefulness of a soil survey in community planing? The question has been answered favorably and emphatically by Mrs. Charles R. Thomas, member of a firm that has just prepared a master plan for the fast-growing seacoast town of Hanover, Massachusetts.

The Town of Hanover, approximately 20 miles southeast of Boston, was one of the first to be settled in the country. Use of the land has undergone several transitional periods since the town was settled in colonial times. The most recent transition has led the town to become increasingly residential.

A growing population needs new housing, new commercial enterprises, new industry, new roads, and new schools. Land use and water problems are always present and become intensified with the rapid urban expansion.

Working closely with Soil Conservation Service soil scientists, Mrs. Thomas learned the complexities of their mapping techniques, and referred to their findings while helping Hanover to blueprint its future.



Chairman Philip C. Beal (l.) of Hanover Industrial Development Board and SCS Soil Scientist Charles W. Upham, in front of 100-year-old town hall, discuss soils information for new town plan.

"We've relied heavily on precise soils information whenever we could get it in planning other towns," Mrs. Thomas said. "At Hanover, we found it tailored exactly to our needs."

As a result of her experience, the Massachusetts consultant has written a guide to use of soils interpretation for community planning. Mrs. Thomas said accurate soil maps removed much of the "educated, intuitive guessing" from her type of work, and that the onsite survey lent authority to decisions affecting properties involved in land-use regulation.

The Hanover plan and Mrs. Thomas' soil science evaluation have been published for wide distribution by the Massachusetts Department of Commerce Planning Division. The two documents will

The author is field information specialist, Soil Conservation Service, Upper Darby, Pa.

HOW A SOIL SURVEY IS MADE

A SOIL SCIENTIST'S MAJOR TOOL OF TRADE IS THE SOIL AUGER. HE HAS DIFFERENT KINDS OF AUGERS. SOMETIMES HE USES A SPADE.

HE USES AN ADJUSTABLE HAND LEVEL TO MEASURE THE SLOPES.

THE SOILS INFORMATION IS MAPPED IN THE FIELD ON AERIAL PHOTOGRAPHS. THE KIND OF SOIL USUALLY CHANGES SEVERAL TIMES IN THE DISTANCE OF A QUARTER MILE.

PERIODICALLY THE SOIL SCIENTIST MUST EXAMINE THE SOIL IN DETAIL IN DEEP PITS AND RECORD HIS FINDINGS.

FIELD MAPPING IS BACKED UP BY STATE AND FEDERAL LABORATORY INVESTIGATIONS AND RESEARCH. HERE THE KIND OF CLAY IS BEING DETERMINED BY X-RAY.

INFORMATION FROM THE SOIL SCIENTIST'S FIELD SHEET IS TRANSFERRED TO A SOIL MAP TO BE PUBLISHED WHEN THE COUNTY IS COMPLETELY MAPPED.

Mrs. Thomas explains master plan locations on Town of Hanover map.

serve as case studies for hundreds of other Bay State communities grappling with the problems of rapid expansion. Offered as models are nine color-rendered maps delineating soil areas in relation to sewage effluent disposal; homesites; athletic fields; wetlands for wild waterfowl; sources of sand and gravel; roads; woodland; surface runoff; and agriculture.

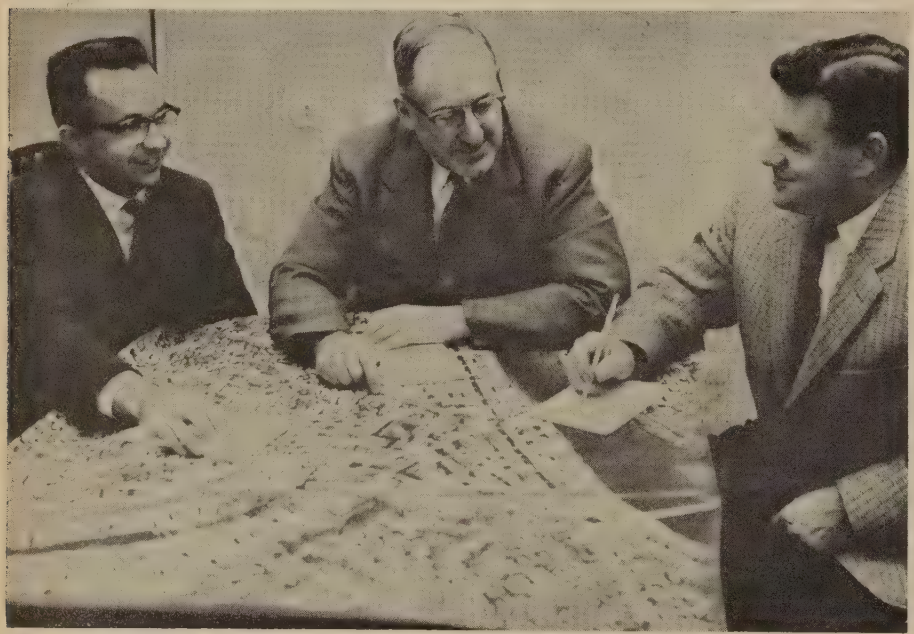
Success of the Hanover project has spurred requests for additional soil survey assistance in towns throughout the 15 soil conservation districts which blanket Massachusetts from Cape Cod to the Berkshire Hills. In response, the SCS has agreed to supply soil survey information on a cost-share basis to the community. Cooperative agreements have been signed with 39 towns embracing 640,000 acres. Fifteen other towns are considering similar action.

Kinds of maps furnished vary from general soil groupings for overall planning to detailed maps outlining smaller parcels, for use by subdividers and municipal developers. Since interest began to quicken, the SCS has continually added refinements to soil maps prepared for community interests.

As an example, symbols recently have been added to make understanding of the soil maps easier for urban planners coping with soil areas having severe or very severe limitations for use. The revised symbols indicate the precise nature of limiting factors such as shallow depth to bedrock, high water table, or very stony condition. This information tells the consultant, town officials, or developers the specific difficulty that needs to be overcome or planned around.

In concluding her evaluation report, Mrs. Thomas said:

"If planning boards had made use of such information in the past, they would have more clearly complied with their purposes in regard to health and general welfare and could have avoided many costly errors. In the case of Hanover, serious errors could have been avoided."



Growing number of towns referring to soil survey information in planning is discussed in Boston office of Massachusetts Department of Commerce by Director of Planning Normand O. Pothier (center) and aids, Geographer Peter F. Emens (l.) and Engineer Frederick A. Fallon.

◆

"When farm and city people have a chance to get together, they learn more about each other. They gather facts instead of rumors—develop friendship instead of misunderstanding." — Dr. Philip J. Leyendecker, dean and director of agriculture and home economics, New Mexico State University.

"Hi Neighbor!" Company's Key to Conservation Recreation—Jobs

By Chester Bellard

The welcome.

"WELCOME Neighbor!" reads the sign as you drive up to the T. L. Jones Company lake and recreation area in the Flatwoods community of Louisiana's Rapides Parish. The sign means what it says.

The lake and recreation area nestles in one of the valleys and attracts a crowd on weekends or during off-duty hours.

Six years ago, when the company leased some 90,000 acres of cutover land, a crash program for getting it planted to trees was set in motion. Seed was sown by aircraft, seedlings were planted with machinery or by hand, and in one way or another the job got done. Local people from nearby have played a big part in establishment of the forest program.

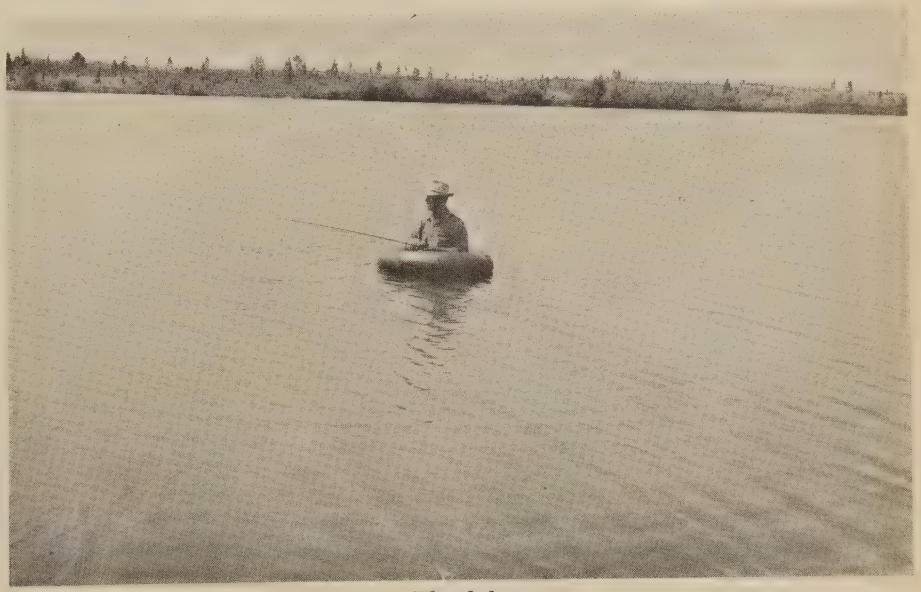
The company hired local people, many of whom still are employed by the company. But, regardless of whom they work for, the company's nearby neighbors who formerly didn't have convenient recreational facilities, are welcome.

Shortly after the company developed a conservation plan on its land in cooperation with the Calcasieu Soil Conservation District, Soil Conservation Service technicians through the district helped it locate and design the 54-acre lake. The company built it with its own construction machinery, during slack seasons.

Free swimming, boating, fishing, and picnicking continue through the season. The company maintains the access roads, has stocked and fertilized the lake and provided habitat for wildlife, and has built picnicking facilities.

The company has applied the woodland conservation job to what was once devastated cutover, barren-looking land. Pine trees of various ages now grow on the rolling Coastal Plains hills. Where timber was already growing, it has been thinned to proper spacing; and in the mixed stands the scrub hardwoods and shrubs have been deadened to release pine. Firelanes weave protection into the pattern in all directions. Signs reading "Hi Neighbor!" along the roads through the area give planting dates and other information about the fields behind them.

Community development has paid off in many ways. Everyone likes to be the company's neighbor, and is ready and willing to lend a hand in case it is needed. For example, fires just don't "break out" any more—and if they did they wouldn't get very far, because the company and its neighbors are interested in each other's welfare.



The lake.

The author is work unit conservationist, Soil Conservation Service, Alexandria, La.

Secretary Orville L. Freeman.

Conservation of soil and water and related resources is high
Stefferud and 92 authoritative writers in the 1963 Yearbook of
is satisfying for people both in rural and urban communities.
in the Foreword by Secretary of Agriculture Orville L. Freema
opment—of itself and in relation to metropolitan America—is
Rural Development and Conservation John A. Baker. Excerpt

A Place to Live

The Yearbook of

FOREWORD:—This is a time and this is a book that call for discussion, cooperation, and vision to channel great forces of change in directions that ensure that America will always be a good place to live.

The signs of change are everywhere. We see them in the growth or decline of communities, the building of highways and other facilities, the moving of people to new homes and jobs, the renewal of cities and the growth of suburbs, the enlargement of some farms and the disappearance of others, questions about the place of family farms as a dynamic force in agricultural production, shifts in the uses of land, and changes in our human relationships, institutions, and aspirations in rural and urban America alike.

But the meaning and the relentless force of the changes and their diversity become fully clear only if we fit them into a broad perspective. Just as we need a map of all major highways, not only the roads in our own county, when we start a long trip.

A perspective, such as this book aims to give, discloses that a new economic order is taking shape on American farms, in rural America, and in cities. It is a product of a technological-scientific revolution, which began 200 years ago and has speeded up tremendously in the past few years.

Its effect on agricultural production has been almost beyond belief. Its effect on farmers and communities that could not keep up with its fast pace has been sorrowful. It has made agriculture miraculously successful, but it is a warning signal if the changes, like an automobile out of control, are so fast, so undirected, or so unmindful of traffic signs and lights as to jeopardize the well-being of people . . .

Nationally a new situation has arisen, compounded of changing and growing needs for more land for industry and more water for everybody; for more and better community services; for a reevaluation of the uses of land; and for plans for the wise, enduring use of land, water, forests, open spaces, air, rivers, and seashores. . . .

We have an opportunity to bring closer together all parts of our population, our economy, and our geography and so to help us realize that the prosperity of city people is tied closely to the well-being of rural people, that many traditional distinctions between city and country no longer are true, and that the United States is one Nation, indivisible. . . .

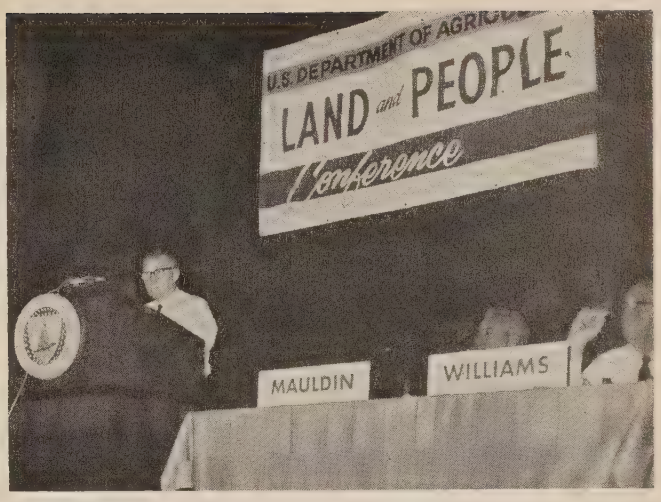
Of all our resources, the most valuable are people. Changes in rural America left many rural people disadvantaged. Less than a third of our population now is rural, but more than half of the 8 million American families whose yearly incomes are below 2,500 dollars live in rural areas. More than one-fifth of the 22 million youths who live in rural America are members of poor families. Many of our people are unemployed. Many are underemployed. Many need training for new work. Many need help.

To help people, the Department of Agriculture, which has a glorious history of service to all Americans, has embarked on Rural Areas Development programs. Their aims are to revitalize and recapitalize town and country, to improve or redevelop physical resources, to put the resources to work for all America, and to provide new or improve public facilities and new economic opportunities.

They will have a great and good effect on our family farms, which as productive units have met the test of time but which have been threatened by forces outside of farming. . . .

We have also the opportunity to assess the function of government in the work before us. I, myself, believe the Federal Government must take a leading part in rural economic development because of its wide scope. But the work also requires investment capital and the help of commerce and industry. It will require the resources of State and local government, but it can succeed only with the initiative and leadership of local people.

among technological advancements presented by Editor Alfred Agriculture as helping to make America "A Place to Live" that The theme for the 79 chapters in the 608-page book is projected ; and the significance of today's expanding rural areas devel- ummed up in the concluding article by Assistant Secretary for from their presentations appear below:



Ass't Secretary John A. Baker.

WHEN PEOPLE MEET, DISCUSS, AND ACT:— Success in rural areas development is keyed to the ability of local people to set their goals in the light of their needs and their realizable potentialities.

Every possible source of technical assistance and service should be considered, and all that can be useful should be drawn on. Usually, no single agency, Federal or State, and no single private enterprise, commercial or cooperative, can supply all of the aids needed to work out the complicated problems of any area. . . .

Land, water, timber, and human resources must be put to work systematically for rural America to move all of America ahead more rapidly. . . .

Programs in the Department of Agriculture include 37 services that offer help in rural development. They are of four types:

Those that contribute to the improvement and stabilization of farm income;

Those that provide technical services and financial resources for the balanced use, development, and conservation of soil, water, forests, and other natural resources;

Those that encourage and facilitate the establishment and expansion of economic enterprises, including family farms, industrial and commercial firms, recreational facilities, and farmers' cooperatives, and

Those that provide leadership, technical services, results of research, and financial resources to stimulate area planning, organization, and action in communities. . . .

Each contributes also to other broad national goals.

(Thus): The Cooperative Federal-State Extension Services provide assistance in organizing and operating rural areas development planning committees and similar local bodies through education for action and organizational leadership for local and State planning activities as well as other specialized technical services.

The Soil Conservation Service administers the program of technical services to members of soil and water conservation districts established under State laws, soil and snow surveys, watershed protection and flood prevention projects programs, the Great Plains conservation program, and a program of special resource conservation and development projects. . . .

Supporting scientific research for rural areas development activities is conducted by the Agricultural Research Service; Economic Research Service; State agricultural experiment stations, supervised by the Cooperative State Experiment Station Service; the Forest Service; the Agricultural Marketing Service; and the Farmer Cooperative Service.

Farm commodity price support and related programs are administered by the Agricultural Stabilization and Conservation Service. The Federal Crop Insurance Corporation and the production emergency loans of Farmers Home Administration also have leading roles on this stage. . . .

Metropolitan America cannot exist without rural America, but, busy with its own growing pains, metropolitan America does not quite understand rural America and tends to overlook it. Meanwhile, rural America, caught up in wrenching global changes neither of its own making nor to its own liking, has some justification for feeling neglected, put upon, and frustrated.

Yet, as the Nation grows it must recapture and improve the sense of unity of simpler times. It must provide a broad opportunity for people in rural America to attain deeply felt aspirations on a parity with urban America. To reach this goal requires higher real incomes and faster economic growth in rural America. Rural Americans need and deserve a higher grade of economic opportunity, more income, more purchasing power, better living.

"A Place to Live" may be bought at $3.00 from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. It is not available from U. S. Department of Agriculture offices.

Community Watershed Dam

Helps Cut Fire Insurance

By R. M. Dailey

PROPERTY owners around Walnut Cove in North Carolina are paying less for their fire insurance because of a new fire truck that two water-ski shows on a community small-watershed flood prevention reservoir helped the Volunteer Fire Department to buy for its rural fire-fighting unit.

The first of 13 reservoirs planned for the $2-million Town Fork Creek watershed project, the dam started in September 1961, 5 miles north of town, was not even completed when the fire department promoted its first water-ski show. More than 2,000 people attended this and the later event, paying $1 admission for adults, with children free.

More than 2,000 people saw two shows.

Fire department volunteers are proud of their new truck.

The two shows netted $1,100 in admission fees and profits from a concession stand operated by the department's auxiliary. The money assured the new truck; and since it was bought, fire insurance rates have dropped an average of 20 percent on rural property within a 3-mile radius of the fire station. This area includes 16,000 acres in the watershed.

The improved fire department and the watershed project "grew up" together. In 1956, the community found its volunteer fire department inadequate for modern times. There was only one hose-carrying truck and no headquarters building. Reorganization called for the division of the 37 members into town and rural units, and for a new $10,500 pumper truck with tank, a tank truck from army surplus, and a $12,000 building.

About the same time, farmers and townspeople applied for a watershed protection and flood prevention project for the watershed. Walnut Cove is just out of the flood plain near the lower end of the 84,521-acre watershed, which lies in southern Stokes and northern Forsyth counties, not far from Winston-Salem. The project was approved by the Soil Conservation Service for planning in 1958, and by Congress for operations in 1960.

Its sponsors, the Stokes County and Tri-Creek soil conservation districts and the Stokes County Board of Commissioners, as well as the Town Fork Creek Watershed Association, were glad to have public attention called to the first reservoir and to the recreation pos-

The author is former State conservationist, Raleigh, N. C., and now assistant deputy administrator for watersheds, Washington, D. C., Soil Conservation Service.

sibilities on watershed reservoirs. Fred D. Cooke of Rural Hall, one of the seven owners who granted the fire department free use of the 38-acre reservoir for the water-ski shows, already had improved his lakeside area for recreation with a boat dock, swimming beach, and picnic area.

"We kept our family together this summer and enjoyed resort facilities here at home because of the lake," Cooke reported last fall. "Our teenagers say it is the best summer we have spent."

In addition to their many recreation opportunities, the 13 reservoirs are estimated to provide annual benefits of $144,000 on the 3,831-acre flood plain. Benefits are counted upon to total a million dollars or more on other lands.

"This is what the Department of Agriculture calls 'Rural Areas Development' at its best," said William F. Marshall of Walnut Cove, chairman of the watershed association. "Rural communities such as ours work on many fronts to build prosperity. But always the local people must be in charge—and working. The joining of two such widely divergent interests as fire protection and flood prevention emphasizes that rural areas development is a many-sided affair. The attainment of a principal goal for one group provided incidental benefits to the other."

FIRST CONSERVATION DISTRICT FARM PLAN MARKER

TRAVELERS going through Seneca, South Carolina, may pass a historical roadside plaque marking the site of the first soil conservation farm plan developed in the United States. It stands in front of the home of Mrs. Ploma M. Adams, for whose original 330-acre farm—more than half of which today is within the city limits—the first plan was made, in 1938.

Municipal, County, State, and Federal officials, agricultural representatives, and civic leaders took part in the marker's 1963 dedication. It was sponsored by the Anderson, Oconee, and Pickens soil conservation districts which made up the original Upper Savannah district in which Mrs. Adams was the first cooperator.

Mrs. Adams long has been a crusader for improvement of farms and homes in Oconee County. As organizer of the Seneca Literary and Civic Club in 1922, for example, she urged the club to plant trees in town, and she set out a large number of pines on her farm, later using some of her timber to build houses. She was "looking around" to get help in further improving her farm when she learned that the soil conservation district had been formed—one of the first 13 districts organized in the country, in 1937—and that technical help would be provided to landowners by the Soil Conservation Service. SCS representatives recalled that upon completion of the plan, "she went right to work, planted trees and grasses, built terraces, and did whatever was recommended."

The State Highway Department will maintain the marker, in the erection of which the South Carolina Department of Archives also cooperated.

Mrs. Adams (r.) and nieces Brenda Lowry (l.) and Mary Martin show off roadside marker at dedication.

SCWD Supervisor W. Hugh McGee tells 25th anniversary audience how as SCS technician he helped Mrs. Ploma Adams (r.) prepare Nation's 1st conservation farm plan shown behind them, as Dr. J. B. Douthit, Clemson, the country's longest-serving district supervisor, and SCS Area Conservationist B. M. Latham (l.) listen.

Cropland Conversion Is Boon To These Hunters and Fishermen

By Hugh Tidwell

Browntopmillet-and-corn wildlife planting, with new irrigation supply ditch in background, on farm of George B. Franklin, Jr. (l.).

THE farm of George B. Franklin, Jr., at Rayville, Louisiana, is being converted to a converging point for fishermen and hunters as a pilot project in the Cropland Conversion Program. The farm, consisting of 18,000 acres of woodland, cropland, and grassland, is near heavily traveled U. S. Highway 80.

Franklin's farm plan, developed with help of the Boeuf River Soil Conservation District, calls for converting cropland to income-producing recreation areas. The Soil Conservation Service, to which the application to participate in the CCP was referred by the Agricultural Stabilization and Conservation Service, has helped in planning large acreages of corn and browntopmillet, in scattered areas, as feed for ducks, quail, doves, and other wildlife. In addition, there will be many acres of crop residues from the corn, soybeans, and oats that are planted on portions of the 7,000 acres of cultivatable land on the farm.

With engineering assistance from SCS, a 200-acre lake is being divided into a greentree reservoir and two fishing areas. Ducks can feed on pin oak acorns in the shallow water of the reservoir, and water in the fishing areas ranges from 3 to 16 feet deep. There are 3 miles of levees around the lake. A 16-inch well will pump about 3,000 gallons of water a minute at flooding time.

"After duck season, we can drain the areas with our system of valves and controls," Franklin explained. "We can take water out of one of the lakes and fill the reservoir, also."

An elevated ditch serves these areas individually, and each of the lakes can be drained separately. The only water going into the lakes will be what rains directly into them or what is pumped into them.

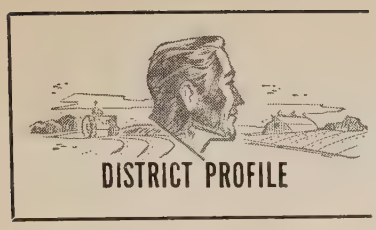
Looking toward future expansion, Franklin has stocked 27 registered quarter horses, as a part of the recreational project. Wild boar have been purchased and will be available for hunting.

"Wild boar hunting is now recognized as one of the most dangerous and most fascinating sports," Franklin said.

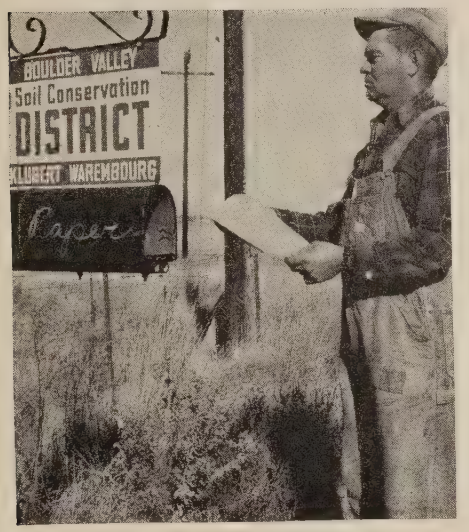
The Franklin Cropland Conversion and Conservation Project lies in both the Boeuf River and the Northeast soil conservation districts in Richland Parish. Leasing arrangements with individuals will produce income from the recreational activities.

Crossline levee between greentree reservoir and fish pond on Franklin farm.

The author is work unit conservationist, Soil Conservation Service, Rayville, La.



Klubert Warembourg



WATER-SAVING and management measures have had an especially important role in the conservation plan by which Chairman Klubert Warembourg of the Boulder Valley Soil Conservation District successfully operates his 132-acre Colorado farm just west of Louisville. His conservation farming success, in turn, underscores his climb up the traditional agricultural ladder of success from farm laborer to tenant to owner.

Warembourg was born in 1921 on a 50-acre irrigated farm south of Louisville, where his parents settled in the early 1880's when they came from Alsace Lorraine. His father worked in the coal mines to supplement his farm income, and young Warembourg grew to manhood working on his father's and neighboring farms.

Warembourg learned the value of conservation farming when, after serving in the Armed Forces during World War II, he and his brother, Walter, pooled their resources for a down payment on a 240-acre place south of Louisville and immediately asked for help from the Boulder Valley district. Their conservation plan is No. 21 on the district roll.

After his marriage to Helen Sekulich of the Louisville community, Warembourg and his wife rented the 132-acre place west of Louisville and went into dairy farming. After a few years he was able to buy this farm on a purchase contract.

Again with the help of the soil conservation district, and of the Soil Conservation Service men assigned to the district, Warembourg developed a complete conservation farm plan. It called for reorganizing the irrigation system, leveling the land, developing an irrigation well from an abandoned mine shaft, building two farm ponds, planting a windbreak, and using a conservation cropping system.

Warembourg's upper reservoir.

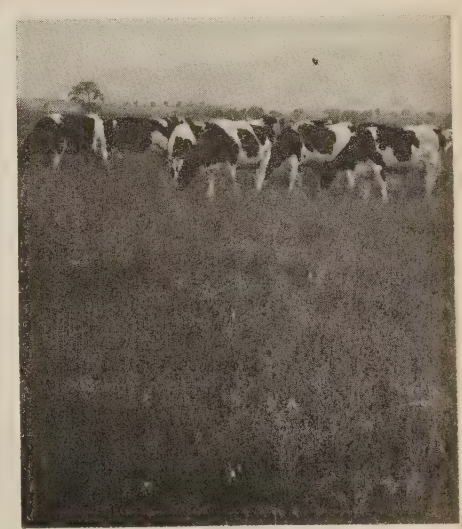
The first year, he was able to level 16 acres for irrigated pasture and build one of the farm ponds. But, even with his Agricultural Conservation Program cost-share payments and doing as much of the conservation work as possible with his own machinery, he saw that to complete his conservation plan and make the farm really productive he would need long-time financing.

He arranged for a Farmers Home Administration farm ownership loan. Later, Great Plains Conservation Program cost-sharing helped him complete the practices called for in his conservation plan.

Among the conservation results Warembourg likes are his yields of 5 tons of alfalfa an acre, compared to only 3 tons before, and the way his 16 acres of irrigated pasture, fertilized as needed, supplies his dairy herd most of the summer.

Vice-president of the Goodhue Ditch Company, Warembourg also finds time to help his children, Christy and Jeff in their 4-H Club projects, and is assistant leader of the local 4-H Club. Students and teachers from time to time visit his farm to see the conservation work he has done.

—Ralph Shipp



Dairy herd on his improved pasture.

Orchardist Brothers Combine Conservation–Marketing Tricks

By Garland J. Kidd

THREE Virginia brothers have combined soil and water conservation with modern marketing to boost profits on their historic Champlain Orchard farm in Madison County. Part of a 1,000-acre orchard setup, Robert, Elvin, and Matt Graves' farm is in the foothills of the Blue Ridge Mountains a few hundred miles from big city markets.

Graves brothers contour orchard with Elvin Graves' home at left.

Old Rag Mountain forms background for this part of Champlain Orchard.

Growing good fruit is one thing, but getting it to market in time is equally important. The Graves brothers started gearing up to modern, fast-moving marketing needs a few years ago. Today, their fruit is picked in the morning, graded, packed, and loaded on trailer trucks in one continuous process, all managed by the Graves. The next morning the fresh fruit is on sale at supermarkets in Baltimore, Washington, and Richmond. A 100,000-bushel cold storage house provides ample holding space for apples to be sold on the off-season winter markets.

Backing up this fast-moving marketing operation, the Graves employ several conservation tricks to assure the best possible fruit. As cooperators with the Culpeper Soil Conservation District, they follow a long-range conservation farm plan worked out with the help of Soil Conservation Service technicians.

Older orchard plantings had been laid out in straight rows on steep hillsides. The friable mountain colluvial soils were very fertile, but slopes made the land unhandy for operating modern spray equipment. The Graves solved this problem by laying permanent pipelines through the orchard with a pump at the base of the slope. The conservation plan licks this problem in new orchards by having the trees planted in contour rows

The author is work unit conservationist, Soil Conservation Service Madison, Va.

around the hills.

"This holds moisture for better tree growth, cuts erosion, and makes spraying, maintenance, and harvesting work easier and faster than the old up-and-downhill method," Elvin Graves reports.

In 1948, the Graves brothers planted 100 acres of apple trees 35 feet apart, on a sloping field, with peach trees set out between the apple trees to produce an added crop while the apple trees were making necessary growth for production. After 12 years of production, the peach trees are now being removed, making room for an apple orchard hitting its prime of fruitfulness.

For the first 3 years after planting trees, clover and rye are grown each year and disked back into the soil. This cultivation stimulates tree growth and adds mulch to the soil, reducing erosion and water runoff.

After the trees get a good start, the entire orchard is seeded to grasses and legumes. The soil and water conserving cover is clipped three to four times a year and left on the ground, providing an additional mulch. The Graves built a series of three irrigation ponds in the orchard to conserve the flow of water from a spring. Even though average annual rainfall in Virginia is 45 inches, dry spells can occur during the critical growth of fruit, making irrigation profitable.

"Irrigation paid enough the first year in use to pay off the entire outlay for equipment," Elvin Graves said. "Irrigation during dry periods not only increases the size of the fruit, but often advances the quality one grade."

The ponds, stocked with large-mouth bass and bluegills, offer an extra recreational bonus to the Graves and visitors.

North Carolina Tobacco Growers Like Tall Fescue in Rotations

By W. W. Stevens

(L.)—Fibrous root system of 4-yr.-old fescue 24 in. long; (r.)—6 mo.-old fescue roots 10-15 in. long.

TALL fescue grass is demonstrating its effectiveness in crop improvement and soil conservation on more than 50,000 acres of North Carolina tobacco land.

Flue-cured tobacco used in the manufacture of cigarettes is grown largely in Virginia, North Carolina, South Carolina, and Georgia. Most of it is grown on well-drained sandy soils—much of it on sloping land with serious problems. Traditionally, it is clean-tilled, thus exposing the soil to erosion. In addition to the hazard of erosion, tobacco also is susceptible to a number of diseases and to damage by insects and nematodes. All create specific problems in applying soil and water conservation programs on tobacco land.

Some of the first attempts to conserve the soil consisted of contour cultivation, use of winter cover crops, terracing, and diversions. These measures were largely mechanical and proved to be of value, but they did not reduce erosion enough to be within the allowable tolerance or help to control soil-borne diseases, insects, and nematodes.

In the late thirties, a few North Carolina farmers tried growing tobacco in rotation with redtop grass. This practice was effective to some degree, but did not do a complete job. Because redtop was not too well adapted to the Coastal Plain and Piedmont sections, where much of the flue-cured tobacco is grown, it did not gain wide acceptance.

Tall fescue grass seeded in a small grain-grass-tobacco rotation.

The author is State soil conservationist, Soil Conservation Service, Raleigh, N. C.

In the early 1950's, the Soil Conservation Service encouraged a few soil conservation district farmers to try tall fescue grass (Ky 31) in their tobacco cropping system. The results of those trials were outstanding, both in the quality and quantity of tobacco produced and in the influence this grass had on disease and nematode control.

This success with tall fescue brought a tremendous increase in the amount of the grass grown in rotation with tobacco. Today, the practice is fairly common in all counties where bright leaf tobacco is grown in appreciable quantities. The only difficulty encountered is where fescue is grown on extremely sandy soils; but it can be overcome by management that includes protection from grazing during late spring, summer, and early fall and by high rates of fertilization.

Several years ago, the North Carolina Experiment Station established crop rotation experiments at its Oxford and Rocky Mount stations to determine the value of fescue in the cropping system. The results of those experiments indicate that tobacco following 2 years of fescue is worth approximately $200 more an acre than if tobacco is grown continuously.

The increased value of the tobacco after fescue is traceable to the addition of perennial grass crop residue, reduction in nematodes, improved soil structure, and increased water-holding capacity. Some of the best tobacco produced in the State has been in a tobacco-fescue rotation.

Tall fescue grass in the cropping system also has proved to be an excellent conservation practice. The soil is protected from erosion while the perennial grass is on the land; water infiltration is increased; soil structure is improved; and damage by nematodes is reduced. The fescue residue in and on the surface of the soil during the tobacco year maintains high infiltration rates, thus reducing runoff.

Though much of the experimental work with fescue has been in a tobacco cropping system, farmers have grown other crops in rotation with fescue. The practice has been highly successful with most row crops.

District Cooperator's Home Movie Shows Neighbors How to Build Pond

By R. R. Kirby and J. W. Gilliam

PLANNING farm or community ponds has been made easier for people in the Chester County (Tenn.) Soil Conservation District since the district has had the use of E. C. Robertson's home movie showing the steps in pond construction.

A 4-acre farm pond, recently completed, was among the conservation developments Robertson planned with Soil Conservation Service technical help when he set out to prepare his 136-acre farm at Jackson for his forthcoming retirement from his service station business. A camera fan, he decided to make a motion picture record of the pond construction.

The site was in a wooded area, and Robertson sold the merchantable timber. When the first tree was felled, he was there to record the event with his movie camera.

Robertson taking home movie shot during pond construction.

Later scenes show the core trench being cut, the dam being formed and compacted, and the spillway construction. Every step was filmed as the operation progressed.

Some of Robertson's friends and coworkers in Jackson who wanted to use the pond for picnics and other recreational activities pitched in and helped with the seeding, mulching, and fertilizing of the dam and the spillway area. The Chester County district ordered bluegill and largemouth bass to stock the pond.

Robertson offered the district use of the movie in promoting its conservation program. After being previewed by the board of supervisors, it was promptly scheduled for showing to several community clubs, 4-H Clubs, and Future Farmers of America chapters. The movie also is available to earth-moving contractors and others.

The authors are, respectively, work unit conservationist, and conservation technician, Soil Conservation Service, Henderson, Tennessee.

Right Equipment Helps District Do Efficient Conservation Job

By Ben Mace

HAVING enough and the right kind of farming equipment gets the conservation jobs done efficiently for cooperators in our Amador (Calif.) Soil Conservation District.

During the first few years of district operation, beginning in 1950, however, farmers were hampered by lack of adequate equipment. Landowners, aware of the desirability of conservation practices, wanted to initiate them on their property. But application frequently was delayed, and plans even were discarded altogether; because farms and ranches were not large enough to warrant each landowner's owning the specific tools for getting certain parts of the conservation work done. He couldn't rent them and only rarely could borrow a machine designed for use for conservation rather than for general farming.

The district first bought an 8-foot grain drill through the State revolving fund on a 5-year lease-purchase agreement, with monthly charges based on use by cooperators. We then purchased a 10-foot fertilizer spreader through the same arrangement.

We were encouraged by enthusiasm of the cooperators, one of whom said of the fertilizer spreader: "This tool is actually making money for me"!

With the first two items paid for, the district was able to expand its inventory to today's 25 separate tools valued at $20,000. This has been made possible through grants from cooperators, the Soil Conservation Service, the State government, and other sources.

A small, pull-type road grader was donated by the County Board of Supervisors. Several items acquired were larger than we as directors felt were suited to district needs. They were offered to equipment companies, on a competitive bid basis, for small tools preferred in exchange, and the district was able to convert from larger to smaller tools.

Amador County SCD President Mace (l.) and Equipment Manager Bob Strickland at new equipment building.

District wheel tractor pulls rotary brush cutter through patch of chamise.

The district also was able to add an implement carrier to its inventory, to allow easy transportation of other equipment. It is a 4-wheeled affair that can be pulled behind a pickup truck.

With considerable help from the County Board of Supervisors, the SCD directors recently also were able to erect a 44 x 72-foot metal equipment building on leased land.

Now our district has an acceptable inventory and an efficient, solvent program which leaves a small margin for operational needs and equipment upkeep, and a small amount for future purchases. The variety of tools available enables cooperators to conduct conservation practices on woodland as well as crop and range land.

Current inventory includes a rotary cutter with 54-inch cutting width, a wheel tractor, tracklayer tractor with blade, front-end loader, and a 3-bottom, two-way plow. The equipment is available for all landowners who have an applicable conservation need, and the rental transaction is made simply by completing a request to the district.

Directors George Winter, Ken Deaver, and I feel we have accomplished one of the most important goals by providing a means of getting conservation on the land. In the process, we have stimulated more interest in conservation methods. With an understanding of requirements for a coordinated conservation program, we have been guided toward long-term goals, adhering to our early decision to get more conservation on the ground.

The author is president, Amador County Soil Conservation District, Jackson, Calif.

These Irrigation Farmers Restore Alkali Lands

By Norris A. Mathey

CONSERVATION measures have helped Cooperators R. D. Bechtel and George Ziegler in Arizona's Florence-Coolidge Soil Conservation District to restore alkali-contaminated lands to good irrigated fields. Landshaping and special water application, fertilizing, and cropping practices have been principally responsible.

Irrigation after leveling on R. D. Bechtel farm.

Small grain planted first year after leveling.

Bechtel, a cotton farmer, and Ziegler, a dairy and cotton farmer, farm a few miles west of Coolidge in Pinal County. Parts of both farms had become so contaminated with alkali that the land no longer could be farmed economically.

Both Bechtel and Ziegler have been district cooperators for more than 10 years, during which time both farms have had a facelifting. With technical help from the Soil Conservation Service, field layouts have been changed, some of the irrigation ditches lined with concrete, most of the fields reshaped to desired irrigation grades, and cropping systems adopted that keep the soils in a more favorable condition for irrigation farming.

The first phase in conversion of the alkali fields was to reshape, or level, the land to the desired irrigation grade. This was actually the only phase of the two farm programs that was similar, and even this was somewhat different. Bechtel leveled his salty fields flat, while Ziegler leveled his to a uniform grade—both with a view to getting maximum effectiveness from the water in leaching out the alkali.

Ziegler, being a dairy farmer, had a large quantity of barnyard manure available which he applied to the alkali fields, at about 30 tons to the acre. The manure was plowed into the topsoil and the field planted to annual forage

The author is work unit conservationist, Soil Conservation Service, Coolidge, Ariz.

crops, either barley or sudangrass, depending upon whether it was a winter or summer planting.

After planting, the field was irrigated heavily, using upwards of an acre-foot of water to the acre. The crop then was pastured until the end of its growing season, when another, larger, application of manure was made—up to 40 tons an acre on some spots. This fertilizing-cropping program was repeated until the desired low level of alkalinity was reached.

"A program of this sort takes time," Ziegler says, "but there is little out-of-pocket cost, as the value of the forage feed produced is about equal to the farming costs; and my land is getting better all the time."

Bechtel works 10 tons of agricultural gypsum to the acre into the top 4 inches of soil, and puts on a leaching irrigation. The field is treated as one large border and covered continuously with water for 3 weeks.

George Ziegler applying a leaching irrigation to alkali land.

During this period, about 3 feet of water has been applied to the field. Alkali has been washed down and out of the topsoil, and the concentration of salts in the upper subsoils has been lessened enough to provide for a fair water-intake rate.

The field is then planted to alfalfa with a barley nurse crop. Barley is grown for its relatively shallow root system, that increases the organic-matter content of topsoils. Alfalfa is grown for its deep and heavy root system, that tends to keep the subsoils open. After the barley has been harvested, any spots in the field that failed to produce are given another application of gypsum and reseeded to alfalfa, after which the field is irrigated as necessary until a stand has been obtained.

Bechtel has found that even though his first costs are high in making a good farm out of alkali land, the results have been comparably high.

LAND AND WATER USE. Edited by Wynne Thorne. 364 pp. 1963. American Association for the Advancement of Science. Washington, D. C. $8.00 ($7.00 to AAAS members). Publication No. 73.

This useful reference book brings together 23 informative and thought-provoking papers presented at the Land and Water Use symposium of the Association held in Denver, Colo., December 27, 1961. As Dr. Thorne points out in the preface, the primary concern of the symposium was the concept of land and water as related resources, with emphasis on the critical problems of land and water in the mountain and plains region.

Numerous professional societies sponsored the symposium and sent some of their most competent thinkers and writers. For example, Roy D. Hockensmith of the Soil Conservation Service presented the results of the U. S. Department of Agriculture's Conservation Needs Inventory. This cooperative study, made with the active assistance of about 3,000 county committees of landowners and operators, and with technical backstopping, provides the most accurate estimates of current land use in our Nation's history and projects the changes in land use expected by 1975.

"Livestock Interests in Public and Private Lands of the West" is the title of an important paper by Ralph E. Hodgson, supplemented by M. L. Upchurch's "Public Grazing Lands in the Economy of the West." Hodgson, of the Agricultural Research Service, points out that the 17 Western States have 57 percent of the Nation's beef cattle and 74 percent of its sheep. Upchurch, of the Economic Research Service, calls attention to the wide variation among the Western States in their dependence on public range, and the fact that nationally the public lands provide only 10 percent of the grazing requirements of beef cattle and sheep.

N. Keith Roberts, of Utah State University's Department of Agricultural Economics, comments in "Managing Private Lands in Relation to the Changing Uses of Public Lands" on the changes livestock producers have been forced to make in their operations in the Inter-Mountain West as a result of cuts in grazing permits on the public range. He also examines the future—a future characterized by an expanding use of the public lands of the West for recreation with corresponding reductions in their use by livestock.

"Land and Water Use" is a reference volume of value not only to conservationists but to overall planners and to individual land-

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owners in the West who will face many critical decisions on land use in the years ahead.

—J. C. Dykes

CAREERS IN CONSERVATION —OPPORTUNITIES IN NATURAL RESOURCES. Edited by Henry Clepper for the Natural Resources Council of America. 141 pp. The Ronald Press Company. New York. $3.75.

This book can be described best as an excellent guide for providing essential information for young people who are considering a professional career in conservation of natural resources. It should serve as an especially valuable tool for those guidance counselors who want authoritative information to use in assisting students who are looking for challenging opportunities on: the job requirements, employment opportunities, education needed, compensation and rewards, and colleges and universities where professional educational opportunities are available.

Separate chapters cover soil conservation, wildlife management, fisheries, forestry, range management, watershed management, parks and recreational development, and natural resources administration. They are written by specialists who are recognized as well qualified within their professions to advise on educational preparation of careers in those fields.

Gladwin Young, associate administrator of the Soil Conservation Service, is author of the chapter on soil conservation. He observes that soil conservationists and other SCS technicial specialists who work directly with farmers and ranchers, leaders of soil conservation districts, city, county, and State officials, and civic leaders each has the satisfaction of knowing that his job is essential to the national welfare, that it is appreciated by the many individuals and organizations with which he works, and that it will have lasting value to mankind."

The other authors are: E. L. Cheatum, assistant director of the New York State Conservation Department's Fish and Game Division; Kenneth D. Carlander, professor in the Department of Zoology and Entomology at Iowa State University; Arthur B. Meyer, editor of the Journal of Forestry; L. A. Stoddart, head of the Department of Range Management at Utah State University; Robert E. Dils, professor of watershed management at Colorado State University; J. V. K. Wagar of the College of Forestry and Range Management at Colorado Springs University; and Roger D. Hale, past vice-president of the Conservation Foundation and past chairman of the Natural Resources Council of America, which sponsored "Careers in Conservation."

The Council is a nonprofit, nonpolitical organization of 36 national and regional associates dedicated to the wise use of our renewable natural resources. E. H. Graham of the SCS and Daniel A. Poole, wildlife biologist and editor for the Wildlife Management Institute, served on the editorial committee in preparation of this book. It should serve to answer many of the questions prospective conservationists have about preparing themselves through proper professional education for a career in this field.

—E. J. Peterson

Have You Seen?...

• "One Step At a Time" by Kent Alverson of the Soil Conservation Service, USDA PA-501. In eight steps, one step at a time, this bulletin tells what should be done in applying soil and water conservation on the land. (Supersedes PA-69, "First Things First.")

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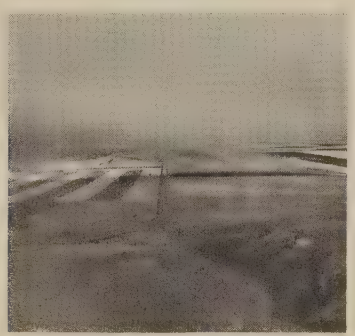
"A program designed to change an exploitative or speculative type of agriculture to one of stability and permanence must take into account all factors relating to the use of the land. It must involve in particular the physical features of the soil, including the degree and rate of erosion for each field and parcel of land. It must include careful studies of the capabilities of each field and parcel of land for the production without accelerated erosion of cultivated crops, pasture, permanent hay, woodland, and wildlife. The best species and strains of plants must be determined, not only from the standpoint of production but from the standpoints of persistence, and erosion-control and soil-building values. The safest and most effective practices relating to water conservation are of utmost importance; and proper fertilization, tillage, harvesting, handling of crop residues, grazing, and mechanical measures for the control of run-off must be put into operation on a permanent basis. Extremely important also is close consideration of the economic and social statuses and needs of farmers and operators."



COVER PICTURE.—The effectiveness of conservation farming in controlling costly wind erosion is shown graphically in this picture taken in Cascade County, Mont., in February 1960. The strip-cropped fields at left and right are safely anchored against the wind that literally is blowing away the unprotected field in between.—Photo by Merle B. Brunsvold.

VOL. XXIX, NO. 7 FEBRUARY 1964

CONTENTS

Page

147 Great Plains Profits in '60's From "Dust Bowl" of 30's
By Cy Luker

150 Metropolitan East Has Wind Erosion Too
By John A. Krohn and Vernon E. Johnson

152 Wind Erosion Laboratory Finds Answers
By N. P. Woodruff

154 Farmers and Conservationists Apply Research Findings
By Edward R. Weimer

157 In Western Michigan—It's an Ill Wind That Blows No Good
By William M. Allred

158 Southeast Borrows From West to Fight Wind Erosion
By Walter S. Allen

160 "What Happened to the Shelterbelt?"
By A. E. Ferber

163 Cover Crops Lick Wind Erosion for Red River Valley
By Nels Snustad and H. A. Tvedten

164 Wind Erosion Menace to Farms and Roads in Illinois
By Homer M. Kuder

166 Conservation Showplace Farm Not Bothered by Drought
By Gilbert G. Bierwagen

167 Colorado Farmers-Ranchers Take Wind Out of Drought
By Mott R. Duncan

Soil Conservation

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FRANK B. HARPER, Editor

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Great Plains Profits in '60's From "Dust Bowl" of the 30's

By Cy Luker

PEOPLE of the periodically drought-plagued Great Plains are restoring the land face of this vast and fertile farm belt extending across the 10 mid-continent States from North Dakota to Texas. Farmers and ranchers, townspeople, and local, State, and Federal governments are working this magic in the Nation's longtime "breadbasket" through cooperative land-use and water-management conservation undertakings.

Today's national action program of soil and water conservation came about in the first place as a result of the great Plains drought in the 1930's, that sent wind-eroded soil dust drifting across the continent past the national capitol dome and out over the Atlantic Ocean in May 1934, and again in March 1935. That was while Congress was considering legislation to establish the Soil Conservation Service as a permanent agency in the Department of Agriculture for carrying on erosion control and related activities begun in 1933 by the Soil Erosion Service.

With this further dramatic impetus, the law setting up national policy on and machinery for Federal technical and other help in dealing with wind and water erosion, flood prevention, and allied land and water resource problems was enacted on April 27, 1935, as Public 46 of the 74th Congress.

The author was formerly assistant to the Administrator, in charge of the Great Plains Conservation Program, Soil Conservation Service, Washington, D. C. (See *Soil Conservation*, November 1961.)

Man's battle against the vagaries of Nature and the ravages of

Cy Luker.

his own plows in wholesale sod breaking for grain growing in the 1920's was on in earnest in the 600-800-mile wide, windswept trough between the Rocky Mountains on the west and the 100th meridian roughly dividing the Great Plains from the humid Corn Belt on the east. But, as those of us can testify who were recruited within a month or two to expand the organization of wind erosion control demonstration projects in cooperation with farmers and ranchers and with State agricultural agencies, the war against the destructive forces of wind erosion was not to be a short one easily won.

For many years it has been recognized that the hazards of climate, variable soil conditions, and economic factors combined often have made agricultural production uncertain in this area. The Great Plains Agricultural Council, over a period of 20 odd years' study, advised on the need for more careful consideration and treatment if periodic adversity was to be reduced. Out of this background of practical experience and professional study and discussion came greater emphasis upon proper land use and accelerated application of needed soil and water conservation measures by people on the land, with the best help that could be supplied through State colleges, farm organizations, Federal agencies, and others.

Landowners and government together chiseled away on different faces of the Great Plains problem. Programs initiated during the 1930's and 1940's included, also, shelterbelt tree planting, Water Facilities Act developments, Farm Forestry Act plantings, Land Utilization Program conversion of government-purchased "marginal" cropland to grass, and the forerunners of the present cost-sharing Agricultural Conservation Program.

The big breakthrough came when farmers and ranchers began in 1937 to form their own soil conservation districts under State enabling acts and went at the job on a concentrated area or community basis. But even while these districts were perfecting their plans and getting their programs started, with technical and financial help from all available sources,

there was another big plow-up of sod, from 1942 to 1950, in many Plains areas.

This plow-up — inspired by World War II demands for wheat and other food, livestock feed, and fiber crops that the "new" land could produce in abundance in those years of favorable moisture —did not compare to that of the late twenties; but several million acres of sod were plowed. Most of it was on the western fringes of the old "Dust Bowl," where the normal rainfall is least, and the rest was largely on poor land. At the same time, there was several million acres more of poor land that had been plowed during the twenties that, abandoned in the late thirties, again was being cultivated in the forties. Such poor land in the drier sections usually is first to start blowing and blows the worst.

In the 1950's the Great Plains again found itself in one of its worst droughts—some said worse than the one in the 1930's. Rainfall was 200 percent below normal in parts of the drought area. Crops failed year after year, and Federal and State emergency funds were allocated to help livestockmen buy hard-to-get hay for their herds. Dust from still unprotected fields again came blowing out of the Plains—this time as far as deep Midwestern cities, but not across the entire country to Washington as before.

Because of lessons already learned, landowners and operators and the entire Great Plains area fared better than in the 1930's. There was less damage to cropland and ranges, less farm abandonment, and less human suffering. And when the drought was over in 1957, the comeback was quicker, thanks in large measure to research and experience that had been gained in soil and moisture conservation farming.

Widespread appreciation of the necessity for careful land use and water management was reflected in

Neal Keller's plan has balanced operations on his North Loup River ranch in Nebraska's Cherry SWCD—good grass plus winter feed plus abundant water.

Grass, and water for its fullest use by livestock, is a primary objective of today's Great Plains conservation programs. This large, permanent stock pond is on the Sidney Hauge farm near Crosby, N. Dak.

Lining irrigation ditches like this one that supplies 80-acre field for R. A. Howard in the Nueces-Frio Sabinal SWCD in Uvalde County, Tex., is one of today's conservation measures that save water and stabilize land use.

the fact that 469 soil conservation districts had been organized in the 422 Great Plains counties proper by June 30 that year. Their more than 386,000 operating units included 352 million of the 386-⅓ million acres in that area. Many landowners and communities likewise were prompt to make use of the Watershed Protection and Flood Prevention Act which in 1954 authorized local-State-Federal cooperation in developing small-watershed and flood prevention projects.

The drought in the fifties, however, pointed up the urgency of moving ahead still faster with measures to minimize the climatic and other hazards of farming and ranching in the Plains. There was need to bring about greater agricultural stability through cropping and grazing systems, land-use changes, and the application of enduring soil and water conservation practices. A specially tailored Great Plains Conservation Program was enacted in 1956, through which landowners receive Federal payments for fulfilling contracts to plant cropland to grass and carry out other practices. This program, administered by the Soil Conservation Service, supplements other land-use programs, and participants' plans are reviewed by soil and water conservation district supervisors.

Now in the middle years of its projected 15-year span, the Great Plains Conservation Program already has to its credit about 13,000 contracts covering conservation plans on farms and ranches, and workable time tables for carrying them out under about $10 million annual appropriations for the 1958 to 1962 fiscal years, $12-⅓ million for 1963, and about $13.6 million for the current 1964 fiscal year. Program participants are paying about 54 percent of their investment out of their own pockets.

GPCP plans cover nearly 30 million acres in 387 program-designated counties. In line with the program's primary attention to the "land that should never again be plowed," nearly 1 million acres, or 23 percent of the cropland involved in the planning to date, has gone into grassland use or is going into grass. Reseeding of rangeland is the next most extensive practice being Great Plains Conservation Program cost-shared, supported by brush control, stockwater developments, and other grassland treatment measures.

Limited cost-sharing also is provided for developing or improving irrigation systems needed to help production of stock feed, as it also is for other water conservation measures such as water spreading for hay crops. The GPCP also has stimulated farmers' and ranchers' use of soil-protecting stubble mulch tillage on millions of acres of cropland and grazing management within grassland's safe carrying capacity, though neither of these practices is cost-shared.

The comparative ease with which farmers and ranchers using soil and water conservation district and Great Plains Conservation Program plans went through the 1963 drought in different parts of the Plains supports a growing belief that this important agricultural area's economy will not suffer again from devastating "black blizzards" or another dust bowl. Meanwhile, the Plains is providing a working example of Rural Areas Development at its best, in improved economic stability of rural families and of communities small and large, through land-use adjustment and conservation treatment that at the same time cut down on acreages of crops presently produced in oversupply. And the influence of these accomplishments is being felt far beyond the Great Plains, with other major areas having common land-use problems watching closely the success of what actually still is the "pilot" Great Plains Conservation Program.

Districts Meet On Broad Problems

Secretary of Agriculture Orville L. Freeman and Governor William W. Scranton of Pennsylvania were among speakers headlining the scheduled 5-day working program of the National Association of Soil and Water Conservation Districts' 18th annual convention at Kansas City, Mo., February 2 to 6.

In addition to those respective Tuesday luncheon and Wednesday banquet speakers were four authorities on agricultural and related resources at the general session on Wednesday, February 5: President Charles B. Shuman of the American Farm Bureau Federation, Director Henry L. Ahlgren of the University of Wisconsin Extension Service, Director Edward C. Crafts of the U. S. Department of Interior's Bureau of Outdoor Recreation, and Vice-president C. R. Gutermuth of the Wildlife Management Institute. Presentation of the annual report by President Marion Monk of Louisiana, highlighted Monday's opening general session program.

The broad range of resource conservation problems and activities involved in today's rural area development and community planning was reflected further in the agenda of the various committees: including industry relations, rural-urban affairs, shore erosion, the Great Plains, soil stewardship, watersheds and water resources, youth programs, public lands, and recreation and wildlife.

This year's meeting was for officers and cooperators representing nearly 3,000 conservation districts, covering 93 percent of the Nation's farmland and 97 percent of its farms, and by their affiliated Ladies Auxiliary members headed by Mrs. Oscar Hippe of Montana. About 1,500 attended. The Association's first annual meeting, attended by only 18 district leaders, was held in Chicago, Ill., in July 1946.

Metropolitan East Has Wind Erosion Too

By John A. Krohn and Vernon E. Johnson

THREAT of wind erosion damage to food crops and lands which produce them is no farther away from the Nation's leading Boston-New York-Philadelphia area of population concentration than the important vegetable and fruit sections of southern New Jersey or the vegetable- and tobacco-growing Connecticut River Valley in Massachusetts.

Serious wind erosion has been brought under control in the flood plain of the Connecticut River by growers working through their soil conservation districts, but they have to continue practicing careful soil and moisture management to keep wind damage from recurring. South Jersey farmers similarly are keeping at their windbreak plantings and other measures that help keep their lands producing for the metropolitan food markets.

This is not a Great Plains "dust bowl" scene, but soil blowing in 1948 on unprotected fields in Atlantic County, N. J.

This 6-yr.-old privet windbreak hedge and the rye cover crop in foreground are typical wind erosion control measures in Burlington County, N. J.

It once was common in the Connecticut River Valley to have dust-storms so severe that it was necessary to use automobile headlights at midday when driving past cultivated fields. When the Hampden, Hampshire, and Franklin County soil conservation districts which cover the valley were established in 1946-47, wind erosion was considered a No. 1 problem.

Agriculture in the Connecticut Valley is mainly one of cash crops: tobacco, onions, squash, asparagus, potatoes, corn, and cucumbers, with a small amount of dairying. There are many small owners with holdings of only a few acres.

In the conventional cropping pattern formerly followed no grasses or legumes were grown. As a result of this continuous cultivation, the natural crumbly structure of the fine sandy or silt loam soil was destroyed, and it became highly susceptible to wind action. Also, sand whipped along the surface of the ground by the wind cut off the tops of young onion sets and caused blast injury to asparagus tips.

A joint program to control the wind erosion was developed with the help of the Extension Service, the Agricultural Stabilization and Conservation Service, the Soil Conservation Service, and the soil conservation districts. The benefits of

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The Connecticut River Valley as seen from Mount Sugarloaf in Sunderland, Mass.

cover crops were explained in demonstrations, talks, and publications —including one called "Let's Keep the Soil Out of the Kitchen."

Farmers began growing cover crops of either rye, wheat, or field brome, until all but a very few acres of the valley now are tied down every fall. The cover crops control wind erosion while improving the physical condition of the soil. There still is a small problem when regular crops are taken off the land late in the season. Some farmers, for example, now are even considering cover crops in their late cabbages.

Southern New Jersey growers, meanwhile, have turned to hedge windbreaks to stop wind erosion damage to their fields and crops. They have planted up to 5 miles of privet hedges a year in Atlantic and Cape May counties in the Cape-Atlantic Soil Conservation District, which arranged to step up its windbreak campaign by encourging fall plantings in addition to the usual spring distribution of 2-year-old rootstock.

Local farm operators can testify to how bad soil blowing has been, and to the success of their wind erosion control efforts. One, SCD Supervisor Angelo Bylone, at East Vineland, has a half-mile of 15-foot-high California and Amur River North privet protecting his 35 acres of sweet potato land. He reported that his privet, now 10 years old, saved him at least $1,500 potential loss in a 20-acre planting of sweets one spring alone.

Tom Rizzotte, operator of "Pine View Orchards Farm" at Hammonton, figures that his mile and a half of hedge windbreaks have saved him entire crops of sweet potatoes and tomatoes, as well as saving fruit from damage in the first several rows of orchard trees on the windward side. He recalls when "dust piled up on windowsills inside the house" and "I'd get so blinded driving the tractor, I'd have to quit."

Farmers from Hammonton to the Cape agree that privet gives wind-protection all year long soon after planting, with maximum protection within 7 or 8 years at a height of 12 to 15 feet. Farmers also have found that privet hedges attract insect-eating birds and other wildlife; they require minimum care; and they take little land out of cultivation and draw little moisture from adjoining fields. The windbreaks also form boundaries for the farm.

Sand dune stabilization also is an important wind erosion control job in New Jersey's major Atlantic coastal resort areas, as it is on the Delaware and Maryland shores and elsewhere. Native and improved American beachgrasses are used for permanent dune protection; but, particularly after destructive storms like that in March 1962, picket-type fences or brush barriers are put up to trap sand until damaged dunes are rebuilt to the best height for giving protection against future storm tides and waves.

The New Jersey and other beach resorts provide recreation for much of the same heavily populated area that depends upon southern Jersey's sandy inland areas for vegetables and fruit, dairy and poultry products. Dune restoration and stabilization through local, State, and Federal cooperative efforts in the 2 years since "the big storm" have proved effective to the satisfaction of beach property owners and visitors alike.

Wind Erosion Laboratory Finds Answers

By N. P. Woodruff

WIND erosion studies conducted since 1948 by the Agricultural Research Service in cooperation with the Kansas Agricultural Experiment Station have contributed importantly to the effectiveness of today's conservation and other advanced farming methods in reducing if not eliminating the threat of future "dust bowls" in the Great Plains.

One of the best testimonials to that fact was farmers' experience in Kansas itself during a drought in the mid-1950's, which records show was about as bad as that of the 1930's. Erosion of soil by wind was not nearly as serious as it was 20 or 25 years earlier.

One reason for this improvement is that farmers, through their conservation programs, by the 1950's had better "know how," and also had better equipment to till the soil, to plant, and to harvest. But another reason, and one which probably contributed to the first, is that research already was giving us a better understanding of the mechanics of wind erosion and of methods of control.

Wind erosion causes costly damage to millions of acres of land in the United States each year. It occurs in regions where the weather is characterized by (a) generally low and variable precipitation, (b) extremely variable and high wind velocity, (c) high frequency of drought, (d) rapid and extreme changes in temperature, and (e) high evaporation rates. Regions with such characteristics include, first, the Great Plains, the Columbia River Basin, parts of the Pacific Southwest, the Colorado Basin, the muck and sandy soils area around the Great Lakes, and the Gulf and Atlantic Seaboards.

In the Great Plains, about 35 percent of the land is cultivated, and the rest is used for forest, grass, or miscellaneous purposes.

Tree shelterbelts evaluated by (top) using models in wind tunnel and (bottom) measuring benefits in field.

Reliable estimates indicate that 90 percent of the wind erosion occurs on the cultivated land. Thus, the solution to the problem seems simple: Use vegetative cover—Nature's method—to stop wind erosion. Man has not been able yet to find a better way, but, unfortunately, the solution is not so simple.

We must cultivate the land to produce food and fiber. Such cultivation pulverizes the soil and leaves insufficient vegetation for its protection. Wind erosion then becomes a serious problem. Therefore, special ways compatible with producing food and fiber must be developed to control the erosion, through research and application of its findings on the land.

Despite advances made so far in research, there are many phases of this most complicated process of wind erosion that are not yet clearly understood. For example:

Research to date has shown us the important factors that influence the amount of wind erosion that will occur from a given agricultural surface under a given set of conditions. These factors can be put within the framework of a so-called "universal erosion equation," which permits general answers on what practices to use to control erosion. However, there are serious gaps still to be filled before we can answer specific questions.

Awareness of this need recently has prompted the Department of Agriculture and Kansas State University to expand the facilities for soil erosion research at Manhattan, Kans. A new laboratory has been built and equipped with a larger wind tunnel and a raindrop tower. The tower, in addition to the tunnel, will permit more detailed and basic investigations into combined wind and water erosion. Wind and water erosion processes are characterized and governed by many of the same basic principles.

The primary purposes of wind erosion research are to gain an understanding of the mechanics of erosion of soil by wind and to devise methods of its control. To accomplish these objectives, the sciences of physics, meteorology, engineering, mathematics, and statistics all are used. Thus: To learn more about the mechanics of

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erosion, wind structure is studied; velocity profiles over different agricultural land surfaces are measured and analyzed; the aerodynamic forces of lift and drag are measured; gustiness and turbulence studies of the wind are made, with sensitive strain-gage and hot-wire anemometers; and probability analyses of long-time wind velocity and direction records are made to develop prediction equations, and to determine prevailing wind erosion directions. Other climatic varibles, such as precipitation and temperature, also are studied; and their effects are integrated with wind velocity into a single climatic factor which denotes the influence of climate on wind erosion.

The soil likewise is studied in great detail: Studies are made of the influence of soil texture and aggregation; threshold velocities to initiate soil movement are determined in laboratory wind tunnels; rates of erosion in relation to length of field and velocity of wind are measured, using specially designed soil catchers and velocity measuring instruments; effects of abrasion on plants and soil clods and crusts are evaluated; and high-speed photography is used to study movement of soil grains in suspension, saltation, and surface creep —the three methods of soil movement by wind.

The dust load of the atmosphere during duststorms also is measured and is studied in relation to visibility and wind velocity, to determine the rates of its movement from one place and its deposition in other locations. Also, detailed wind tunnel investigations are made of the influence of surface roughness.

To devise methods to control wind erosion, the effects of kind, amount, and orientation of plant growth and residue are studied in laboratory and portable wind tunnels. Various methods of treating soils with chemicals and byproducts of the petroleum industry, such as asphalts, to increase aggregation and to form erosion-resistant surface films are studied, as are effects of different tillage implements on residue management and soil structure.

Stripcropping is studied, to determine the best width and spacing of strips. Various methods of surface roughening and clod formation by emergency tillage are studied. The benefits derived from barriers, including artificial devices, rows of annual crops, and shelterbelts, are studied, both in wind tunnels by using models and under natural conditions. Various types of trees, shrubs, and annual plants are tested to evaluate their potential for forming shelterbelts under semiarid conditions.

In a continuing effort to obtain more basic knowledge of wind erosion and to provide more specific guidance to farmers and soil conservationists alike, research effort during the next few years will be concentrated on the following specific problems:

INSIDE.—Laboratory wind tunnel for studying mechanics of wind erosion.

OUTSIDE.—Portable wind tunnel measures erodibility of stubble mulched land.

(1) Evaluating aerodynamic forces on the ground surface; (2) analyzing airflow, temperature, and evaporation patterns in the vicinity of shelterbelts and other types of barriers; (3) studying the composition and amount of atmospheric dust deposition; (4) determining erosion tolerances; (5) continuing analyses of tillage implement effects on residue management and soil structure; (6) testing trees and shrubs in the field to evaluate shelterbelt potential; and (7) studying ways to improve the wind erosion equation, including determinations of surface roughness after tillage with different implements, evaluations of the prevailing wind erosion direction throughout the United States, determinations of the wind erodibility factor for different soil groups, and computations of short-period climatic factors.

No. 73

This is the seventy-third of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Farmers and Conservationists Apply Research Findings

By Edward R. Weimer

FARMERS and conservationists from North Dakota to Texas are making more use each year of basic information developed by the Agricultural Research Service's wind erosion laboratory at Manhattan, Kans., and correlated with studies and observations by State experiment stations and other sources.

Even though the factors contributing to wind erosion still prevail — frequent recurrence of drought, strong winds during late winter and early spring, and rather extensive areas where fallow or other cultural operations leave soils unprotected—the losses have been progressively reduced, because of better understanding of the problems and better land use and farming methods. These have resulted largely from application of principles, practices, and measures tested by research, advocated by the Soil Conservation Service, and proved out in the year-by-year experience of landowners and operators in their soil and water conservation districts' Agricultural Conservation, Great Plains Conservation, and other programs.

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As set down by the late Dr. W. S. Chepil, for many years in charge of the Manhattan laboratory, the causes of wind erosion are few and simple:

Soil erosion results when strong winds blow across large, unprotected fields with smooth, bare surfaces and loose, dry, and finely granulated soils. By the same token, erosion can be reduced by keeping soil firm and moist; creating soil aggregates, or clods, large and stable enough to resist movement or abrasion by wind; roughening the surface; maintaining vegetative cover (living or dead) on the land; reducing the size or width of fields; arranging fields at right angles to the direction of damaging winds; and reducing the velocity of wind near the ground surface by placing barriers across the path of the wind.

Four neighboring farmers planted 26 miles of single-row pattern type field windbreaks like these 2-yr.-old trees on Ed Flanagan farm near Bismarck, N. Dak.

From the results of the research studies, a "universal wind erosion equation" was developed and is used as a guide to control methods in the different States to help predict susceptibility of fields to wind erosion and to define the necessary controls to reduce this susceptibility. Continuing research has been conducted to evaluate and refine the various factors in the equation, which follows:

$$E=IKCLV$$

This is a symbolic way of saying that a field's susceptibility to wind erosion (E) depends on five factors represented by other letters as follows:

I=Soil cloddiness factor—ratio between erodible and nonerodible soil aggregates.

K=Ridge roughness equivalent —how rough or how smooth the soil surface is.

C=Wind velocity and surface moisture factor—local climatic factors relating to wind erosion.

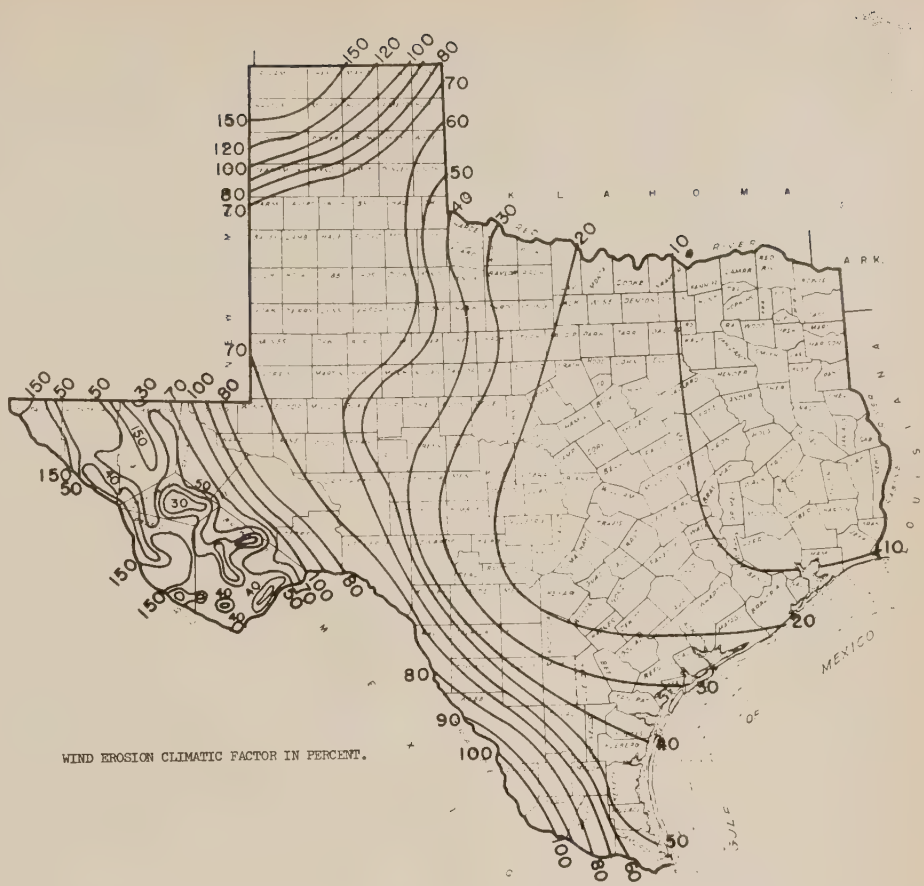
L=The unsheltered distance across the field along the prevailing erosive wind direction.

V=The quantity and kind of plant cover (living or dead) on the surface of the soil.

Many years of investigation were needed to identify and establish means of measuring these factors. Through controlled conditions, using laboratory and portable field wind tunnel equipment, research workers have been able to measure the amount of wind erosion that occurs and determine the effect of changing the various factors that influence it. After field evaluation studies were conducted to adjust research findings to actual field conditions, researchers were then able to assign values to the various factors and to relate their effects to varying conditions.

Development of the "Universal Equation" has afforded the Soil Conservation Service a valuable tool for conservation planning, in the North Dakota and the other Great Plains States. Conservationists now can replace generalized observations or estimates of field erodibility with rather reliable quantitative measurements. With this knowledge, they then are able to design measures to reduce or control erosion.

Adaptation of the equation to North Dakota conditions, to illustrate, was a three-step process: The first step was to evaluate the various factors under North Dakota conditions, make interpretations and correlate our conditions to the basic research, and then assign values for each factor to fit field conditions in this area. The second step was to place the various soils into interpretative groupings, based upon information gathered in step No. 1. As the third step, standards and specifications for the wind erosion control practices were developed, based upon the assumptions and criteria developed in steps one and two.



Wind erosion climatic factor for Texas, expressed as percent of that at Garden City, Kans., combines effects of wind velocity, precipitation, temperature, and evaporation, and indicates relative amount of wind erosion that would occur if all other influencing conditions were equal. Similar factors are available for all Great Plains States.

Many field tests and evaluations were conducted to determine the relative wind erodibility for fields on which the different soils were found. These studies showed a close relationship between the soil-clodiness factors (I) and soil textural classes, water table structure, organic matter content, and calcium carbonate content of the soils, as well as their variation throughout the year.

In conjunction with those evaluations, guidance was given in the field in determining the amounts of surface cover (V) and roughness (K) factors.

Determining local climatic factors (C), next involved a study of weather station records. The climatic values established help us understand the influence of local wind velocity and surface soil-moisture conditions on wind erosion and prevailing wind direction for various locations in the State.

Finally, values for field widths and the effect of wind barriers (L) were established.

Design criteria for wind erosion control practices are based upon wind velocities of 40 miles an hour at 50-foot elevation; because only a minor proportion of our winds exceeds this velocity, and it was felt that practical control could be designed for velocities to 40 miles an hour. Erosion control specifications also are designed to conform to our dominant wind direction of 45 degree angles to fields.

Specifications for practices are based upon 5 tons an acre a year soil losses. This is considered by many research workers to be about the tolerable rate of soil loss, considering permanent damage to soil, loss of productivity, and injury to growing plants.

(Upper l.)—Thousands of acres in western Michigan were marked by sand blowouts like this. (L. cen.)—Stabilizing beachgrass was planted in this pattern. (Low. l.)—Stump fence between houses from pine trees that grew here before cultivation and wind erosion stripped the land, now being occupied by new homes and beautiful lawns on stabilized soil. (Upper r.)—Forests—like these 14-yr.-old red pines—now grow in blow sand first stabilized by beachgrass. (R. cent.)—About 1 million Christmas trees have been harvested each year since 1945 in West Ottawa SCD. (Low. r.)—Truly "a sacred spot of nature rare today!"

In Western Michigan—

It's an Ill Wind That Blows No Good

By William M. Allred

LANDOWNERS and communities in western Michigan's Ottawa and Muskegon counties have damaging wind that used to sweep across their dune and muck lands to thank for much of the extra prosperity and more pleasant living they enjoy today.

It was the wind that prompted them to organize the West Ottawa and the North and South Muskegon County soil conservation districts in 1938 and 1939, as a cooperative last ditch stand in their still losing fight against the dunes marching inland from the eastern shore of Lake Michigan. Today, just 25 years later:

The dunes are covered with forests of marketable Christmas trees or tied down with sand-holding beachgrass; inland vegetable and other croplands are protected against soil blowing by conservation land use; land values in the dunes area are 10 to 20 times what they were; and people from nearby large population centers are moving in, bringing with them new homes, schools and churches, and industries, boosting local business generally, and stimulating recreational developments.

Between 1880 and 1890 most of Michigan's timber was cut. The slash and the remaining timber were burned, and the land was plowed for crops — including the land in sand dunes along Lake Michigan. After more than a foot of organic matter had disappeared quickly under cultivation, the sand began to blow.

During the dry thirties, the entire west side of Ottawa County became truly a desert on the march. As crops were blown out on the sandy area along the lake and the dunes covered the better soils farther and farther inland, merchants and other people began to suffer.

When Michigan enacted its soil conservation districts enabling act and the West Ottawa and Muskegon districts were organized, farmers and their families, teachers and pupils, civic clubs, and church groups all were among those that joined forces in working to stabilize the sand and plant trees. Stabilization of the raw sand dunes and blowouts was a necessity before critical areas could be restored to their safe and natural use for forest cover.

Of several methods for tying down the shifting sands tried by Soil Conservation Service technicians working with the districts, planting American beachgrass proved to be the most effective and economical. Dune areas, stabilized by beachgrass plantings, could be planted with pine trees as permanent cover within 2 to 4 years. More than 6,000 acres have been anchored with beachgrass in the three-district area. In addition, pine trees have been planted so far on about 70,000 acres.

The better quality, heavier sand and muck soils, which make up large areas a little farther inland and are used for growing a variety of crops, such as onions, celery, and other vegetables, also are highly susceptible to wind erosion; and a quarter of a century ago dust clouds on unprotected areas spread over crops, filled drainage ditches, limited visibility on highways, and seeped into homes. In this area, district cooperators are protecting their land with pine tree windbreaks, wind stripcropping, crop rotation with grasses and legumes, cover crops, and crop residue.

Here are some of the economic and other benefits people in these western Michigan localities are realizing from their wind erosion control programs:

Christmas tree production has become a big industry in Ottawa and Muskegon counties. In Ottawa County alone, there are 8,000 acres of Christmas tree plantings, and an average of 1 million Christmas trees are sold and moved out of the county each year. They wholesale at an average price of $1 each; and a large amount of labor is employed by the growers in planting, pruning, spraying, and harvesting the trees.

There also now is 25,000 acres of timber ready for thinning in the West Ottawa district. These forests will yield an average of about 5 cords of pulpwood an acre in the first thinning. In addition to the labor that is furnished to local people in cutting the pulpwood, an estimated $20 a cord more goes to labor in the mill.

Seventeen school forests have been established on public lands, as part of this district's program of teaching the youth of the community the importance of natural resources and their conservation. These school forests are used as outside classrooms for students of all ages. The soil conservation district board of supervisors administers all public lands in the county, and all of this land has been stabilized with beachgrass or pine trees. One 40-acre tract has been developed into one of the

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Director Elwin Woodard of South Muskegan SCD (r.) and Henry Dierking of SCS examine 1-yr.-old medium purple willow windbreak that helps protect cropland.

best field archery courses in the State.

When the district recently revised its program of work better to meet today's broadened land-use and related community conservation responsibilities and opportunities, it especially recognized the increasing importance that recreation is playing as a source of cash income for the farmer. The district board is working with the County Board of Supervisors and others with a view to acquiring additional lands that may be used by the public for recreation areas.

When the district was established in 1938, deer in the district was a rare sight. Today, it is estimated that the local deer herd numbers 3,000. Two hundred bucks were taken by hunters in 1963.

The multiple benefits accruing from sand blow stabilization in this area are attested to most convincingly in the greatly increased land values that have resulted in the West Ottawa County Soil Conservation District. In 1938, land here was selling for $5 to $10 an acre. The same land now is valued at $100 an acre!

Southeast Borrows From West To Fight Own Wind Erosion

By Walter S. Allen

FARMERS plagued by wind erosion in parts of the Southeast have profited from research and experience in the Great Plains and other western areas by borrowing conservation practices that now successfully control their own soil blowing.

Here, the destructive force of the wind has taken its heaviest toll in the Coastal Plain sections of the Carolinas and Georgia and in the north-central ridge and other sandy areas in Florida. Smoothly prepared fields of sandy dry soil, bare of living or dead plants, are most vulnerable. Farmers in these areas have reported that the wind-driven sand cut off young, tender plants at ground level, filled drainage ditches, and even blocked highways. In some cases, only sterile sand was left on formerly fertile fields.

In Hoke County, N. C., for example, wind erosion caused replanting of about 2,500 acres of cotton, 1,000 acres of corn, and 100 acres of tobacco in dry 1955 alone. Nearby counties in the Sandhill area reported similar damage. In South Carolina, a Marlboro County farmer had to haul 12 truck loads of sand out of his garden after a big blow in the likewise dry spring of 1963.

March and April have been the most critical months; but South Carolina and Georgia also have experienced wind damage in February and May.

State Conservationist T. S. Buie of the Soil Conservation Service, which gives technical help to soil conservation district farmers in planning their wind erosion control program in South Carolina, also reported, among other examples of damage, that spring winds filled a drainage ditch with sand three times on a Darlington County farm when the land was being prepared for planting, and that a county road running through this farm became impassable. SCS State Conservationist C. W. Chapman said wind erosion occurred primarily in late winter and early spring in scattered areas of the Coastal Plain soils of south Georgia. Unprotected loamy-sand

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and sandy soils are most susceptible to damage.

"To the farmers of the north-central ridge area of Florida, wind erosion long has been a serious problem," Florida State Conservationist J. W. Hammett of SCS explained. "Here, an intensive agriculture has been built on general farming of gently undulating deep, sandy soils. The same characteristics that make these well suited for cultivation also make them vulnerable to wind erosion. The loose, fine sand particles are easily lifted and carried by winds of medium velocity."

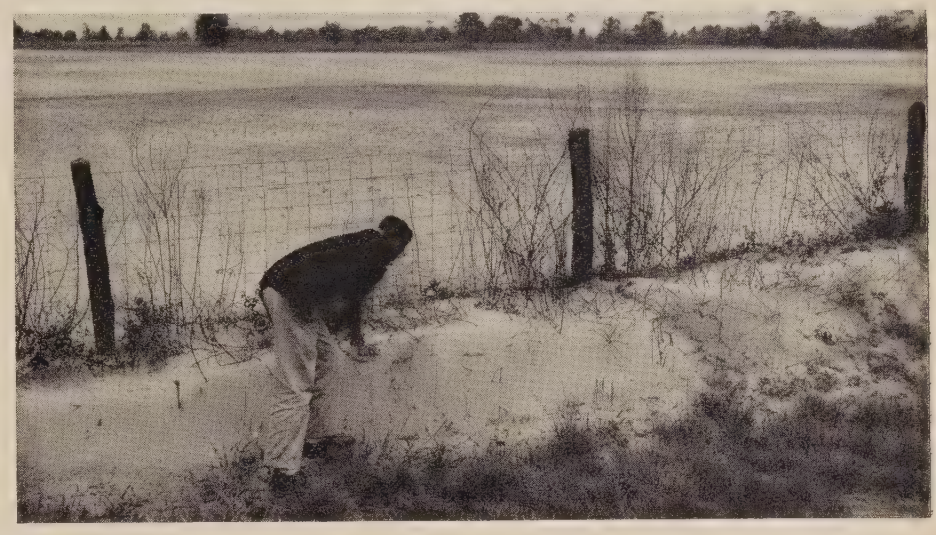
Wind erosion is widespread throughout Florida, wherever the fine-sand soils have been exposed to unrestrained seasonal winds by clean tillage. Soil blowing has troubled truck farmers in the sandy soils and muck soils of southern Florida. Recently, many thousands of acres in central and south Florida have been cleared of native vegetation and planted to citrus. Hammett said failure to provide protective cover on many of these areas has resulted in serious wind erosion problems.

Farmers in the four States have successfully used the more established control measures such as windbreaks of trees and perennial plants and wind stripcropping. In recent years, they also have found some of the newer practices to be effective. These measures include mulch tillage, sod-based rotations, perennial grass, and planting some fields entirely to small grain.

SCS State Conservationist J. P. Kuykendall outlined the principal control steps taken in North Carolina:

"Slopes and other critical areas subject to severe wind damage are most effectively controlled with perennial vegetation. They will serve as intermediate windbreaks and as guides for rotated strips. Some of the good plants are sericea lespedeza, shrub lespedeza, kudzu, and multiflora rose. After the critical areas are protected with per-

Sand blown onto road from unprotected Darlington County, S. C., cropland in one 1961 windstorm completely blocked traffic.



This sand was all that was left of fertile topsoil blown from adjacent Gilchrist County, Fla., field in a 2-day windstorm.

Strip rotation of peanuts and rye in Sumter County, Ga., is representative of wind erosion control measures used in Southeast.

ennials, the cropping system followed is very important. The arrangement of the crops should be in strips across the prevailing winds on the nearly level land and on the approximate contour on sloping land.''

In South Carolina, in addition to windbreaks and wind stripcropping, mulch tillage and cover crops have proved to be the most effective control measures in most sections of the State. Mulch tillage and cover crops also are being used in Georgia and Florida along with other protective measures.

As in other sections of the Nation, some more seriously affected, the never-ending battle of man against the wind continues in the Southeast. The winds will come again this spring. Damage will be done, but conservation practices will reduce the losses substantially.

"What Happened to the Shelterbelt?"

By A. E. Ferber

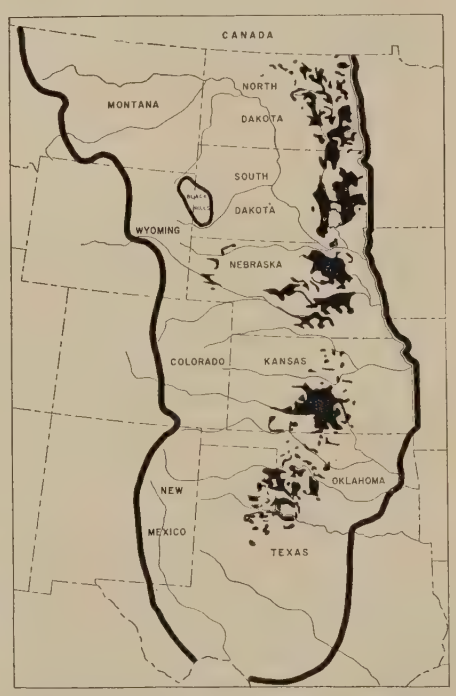
"WHAT'S happened to the Shelterbelt Project that we heard about back in the thirties?'' This question is asked frequently, nearly 30 years later.

In 1935, President Franklin D. Roosevelt authorized the Prairie States Shelterbelt Project tree-planting program for the Great Plains. It was started to put men to work on projects that might help ameliorate the effects of the disastrous drought then building up to its ''dust bowl'' peak in the 10-State region.

Plains farmers and ranchers had been planting trees successfully, even before tree-claim homesteading days in the 1870's, but they were mainly for farmyard and livestock protection. The new program called for tree belts along the windward sides of entire fields, to protect soil and crops from wind-blowing damage.

During the 8 years (1935-42) that the project operated under the shelterbelt name, more than 200 million seedling trees and shrubs were planted by Works Project Administration workers and Civilian Conservation Corps Camp boys under supervision of the Forest Service on 30,000 farms distributed over 6 States. The Prairie States shelterbelt plantings exceeded 18,500 miles in total length and occupied about 238,000 acres in the Dakotas, Nebraska, Kansas, western Oklahoma, and the Texas Panhandle.

The trees and shrubs were planted in strips bordering cropland—not as a solid forest—and usually along the north, west, or south field boundaries, crosswise to the prevailing wind direction. Most windbreak strips were made up of 10 to 12 rows 10 feet apart. The tall trees were in the middle, flanked by bushy type trees, shrubs, and evergreens. Fruit- or nut-producing species often were included for wildlife foods, as the shelterbelts were designed for multiple purposes, with some 40 to 50 locally adapted species used.



Major areas of shelterbelt planting in the Great Plains region by the Prairie States Forestry Project during 1935-42.—U. S. Forest Service.

What is the present status of the original shelterbelt and other tree wind barriers subsequently planted in the Great Plains? Successful tree planting in this normally almost treeless region of low rainfall is difficult even under favorable climatic conditions. Consequently, quite a few of the earlier plantings failed, even though many farmers hauled precious water in barrels and doled it out to their struggling tree seedlings.

A survey made in 1954 showed that 73 percent of the old shelterbelts were still in fair to good condition. But the severe droughts of the 1950's caused many plantings to die out on upland soils in the Southern Plains, while some of those in the Central and Northern Plains have lost their effectiveness through livestock grazing and general neglect. Many of those remaining have been overrun by sod and some need renovation. Present observations indicate that, even so, at least half of the original shelter-

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These single-row pattern field windbreaks planted in North Dakota in the thirties are the type being planted today.

belts are still effective.

Lessons learned from this undertaking, combined with knowledge gained by other Federal and State agencies and landowners themselves through subsequent experience, have enabled present-day Plains tree planters to do a better and more scientific job. The shelterbelt project verified the experiences of early settlers that trees can be grown successfully in this region during most years. That is, if such precautions are taken as careful selection of good quality seedlings adapted to the local soil and climatic conditions, adequate ground preparation, proper planting, and early cultivation to control moisture-competing winds, and care as long as the trees live.

Soil conservation demonstration projects set up by the Soil Conservation Service in cooperation with the States during the mid-thirties also were proving grounds for tree windbreaks in some areas, as they were for many others of our modern cropping, tillage, structural, and other conservation measures.

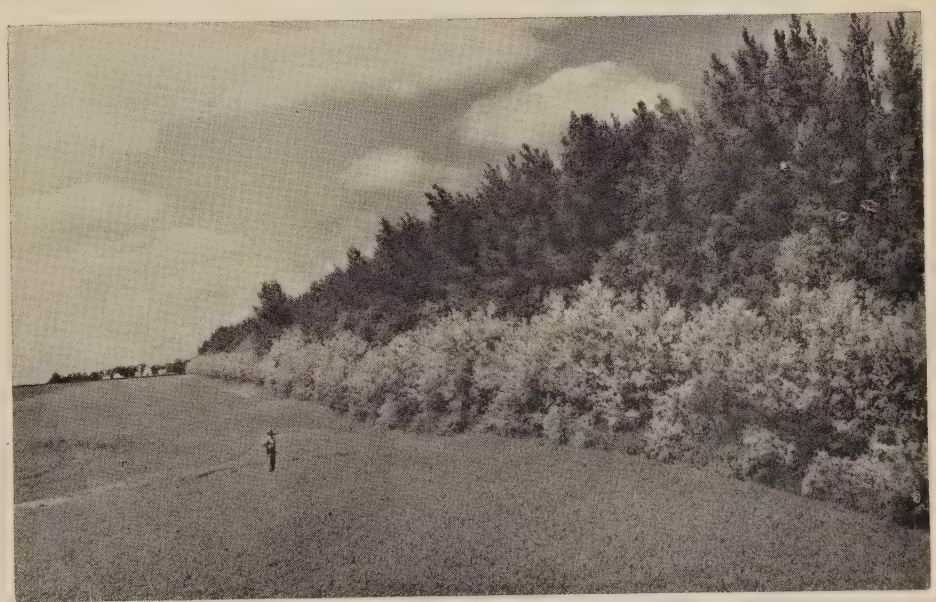
The planting of field windbreaks was stepped up further when farmers and ranchers began in 1937 to organize soil conservation districts authorized by State laws, and was greatly accelerated after World War II ended in 1945. Today better than 95 percent of the arable land in the Plains lies within these districts.

Field windbreak planting has been most active in the eastern and central parts of the Dakotas and in central Nebraska and Kansas; but these windbreaks also are used to a lesser degree in other parts of the Plains where soil blowing is a problem. The planting of farmstead and feedlot windbreaks also has increased tremendously, during the past decade, except for areas in the Rockies, fringes along the eastern border of Kansas and Oklahoma, and most of Texas. Some wildlife plantings are being made regionwide.

It is estimated that between 1935 and 1963, the last planting season, approximately 666,000 acres of trees—benefiting several million acres of cropland and hundreds of thousands of farmsteads and feedlots—had been planted in the Great Plains with the help or sponsorship of public agencies. This total planting has been made up of the 238,000 acres in the 1935-42 shelterbelt program and 428,000 acres planted through these other programs: By CCC camps under SCS direction, 14,000 acres; in SCS demonstration projects and soil conservation districts between 1935 and 1954, 179,000 acres; and by district cooperators from 1955 to 1963, 235,000 acres.

Approximately 35,000 miles of field windbreaks are included in the 428,000-acre other-than-shelterbelt total, and about three-fourths of the overall total acreage was in farmstead and livestock windbreaks.

During this same period, farmers and ranchers on their own initiative planted another 200,000



A field windbreak planted in 1941 by the Civilian Conservation Corps in North Dakota, which now leads in Great Plains tree planting.

Tree belts near Duncan, Nebr., which were planted in 1939 and 1947 by Prairie States Forestry Project and by owner Emil Blaser.

acres or so, to a grand estimated total of 866,000 acres. Figuring 700 or 750 seedlings were planted, on the average, to the acre, something like half a billion trees and shrubs went into the ground during the 28-year Great Plains tree-planting activity from 1935 to 1963.

Soil conservation districts in the Plains are now planting annually approximately 13,000 acres of farmstead windbreaks, 4,000 miles of field windbreaks, and 1,000 acres of miscellaneous windbreak areas. North Dakota landowners alone plant more than 3,000 miles of field windbreaks a year, plus comparable amounts of farmstead windbreaks. Several district-owned tree nurseries in North Dakota grow seedlings as a service to their cooperators. Most seedlings Plains-wide, however, are purchased from State (Clark-McNary) and private nurseries. Plains soil and water conservation districts now own and operate around 450 tree planters, 250 mechanical weeding implements, and 40 chemical sprayers for controlling weeds in newly planted windbreaks. Some districts have provided seedling storage facilities. Local people are employed to operate the equipment, and some windbreaks are planted and weeded on a custom basis, to ease landowners' workload during the cropping season.

Conservation and forestry technicians feel that many more thousands of acres of windbreaks could be used advantageously in the Plains—some estimate as high as a million acres. In addition to tree-growing services they get through their soil and water conservation districts and from the SCS, landowners are helped by agencies such as the Extension Service, State forestry organizations, the Agricultural Conservation Program, the State Experiment Stations, and the Federal Housing Administration, as well as by research workers of the Agricultural Research Service and the Forest Service. Through all these means together the Plains region is getting practical and effective windbreaks, tailored to the needs of the landowners.

Growing field windbreaks is tied in with landowners' overall conservation plans for controlling wind erosion. Windbreaks are not a cure-all, but trees have a place on most Plains farms and ranches, when they are planted in a complete, patterned system of narrow strips, usually about 20 to 30 rods apart, and in combination with other conservation practices. Most field tree barriers are in the 1- to 3-row range; because observations have shown that a relatively wide field windbreak protects no more cropland—for a distance up to 20 times its height—than does a single-row barrier of closely spaced plants, which costs less and takes up less land.

Thousands of today's Great Plains farmers and ranchers are enjoying the benefits of their field and farmstead windbreaks. They have helped reduce soil blowing, and they hold snow on the fields for crop moisture during dry years. Many landowners also feel that they increase cropping efficiency during some years. Others value the additional wildlife and bird habitats that windbreaks provide. Farm and ranch owners welcome the comforts and economic benefits provided by their farmstead and feedlot windbreaks during cold, blustery weather, and they appreciate the snow control they give. As one long-time resident put it: "They make a home instead of just a place to live."

Windbreaks Pay Off

How farmstead windbreaks make money for Nebraska and Kansas farmers was confirmed in a survey reported by District Extension Forester John P. Slusher of Kansas State University.

Of 201 Nebraskans answering the question, "Can we put a dollars and cents value on farmstead windbreaks?", 86 livestock feeders placed their annual savings at more than $800; 62 livestock breeders reported more than $500 in annual savings; 53 dairymen showed yearly savings of more than $600; and farmers with fruit and vegetable gardens credited $80 to $100 a year return to better quality and quantity of their windbreak-protected crops. A few Kansas farmers surveyed, feeding some 100 cattle, reported their average savings as $500 a year as a result of having farmstead windbreaks.

Cover Crops Lick Wind Erosion For Red River Valley Farmers

By Nels Snustad and H. A. Tvedten

SUGAR-BEET and small grain farmers are turning the Red River Valley of the North in Minnesota and North Dakota green again by growing cover crops on fields that formerly were clean tilled and regularly swept by wind erosion.

Principal crops in this "Nile of the North American Continent" are wheat, oats, barley, potatoes, flax, soybeans, sugar beets, and truck crops. With its seemingly endless flatness and deep, dark, heavy, lacustrine soils, the valley would seem to have no problems of land management. Yet there actually are many problems. Among them are lack of adequate drainage, soil compaction, salt concentrations, nutrient deficiencies—and serious wind erosion under intensive tillage management systems such as summer fallowing for sugar beets.

Red River Valley farmers have been working since 1945 through their locally formed soil conservation districts, with technical help from the Soil Conservation Service, to lick the wind erosion problem. Much success has been achieved with wind stripcropping, field windbreaks, stubble mulching, crop residue use, and rough tillage in much of the valley, but the problem was not so easily solved on sugar beet land.

Wind stripcropping and field windbreaks at intervals close enough to control soil blowing were not acceptable to farmers operating large and costly beet production machinery. Summer fallow the year before sugar beets gives highest yields but also leaves the ground open to wind erosion.

As early as 1941 a few farmers tried cover cropping; but it was not until after a meeting held at Moorhead in the fall of 1958 by representatives of the beet company, the SCS, and the Agricultural Research Service that it was decided to push cover cropping through the soil and water conservation districts. In the four crop seasons since, more than half of the 120,000 acres of sugar beets on 1,316 farms in the 11-county Red River Valley area in Minnesota and North Dakota have been seeded regularly to a cover crop; and this practice is spreading.

Oats or barley is seeded on summer-fallowed land in late August or the first week in September. Weed control sometimes is necessary. Flax can be used for cover cropping, but it is hard to get an even stand if the surface is dry at seeding time.

Farmers have found it is better to make solid cover seedings, because the wind often blows soil from bare strips onto the adjoining grain strips in strip seedings and makes it hard to obtain an even stand of beets.

Usually there is some seedbed preparation in the spring; but sugar beets can be planted in the cover crop residue without any working, and a little debris in with the crop after planting may save it from damaging winds.

Farmers using cover cropping generally agree with Hugh Trowbridge, who cover crops about 220 acres every year near Comstock, when he says:

"I would not have any summer fallowed land without seeding it to a cover crop if it was possible

Cooperator Maurice Borgeson (r.) in Walsh County (N. Dak.) SCD uses combination of corn buffer strips and cover crop to control wind erosion along Red River Valley's old Lake Agassiz beachline. Abner Lee of SCS (l.).

The authors are area conservationist, Fergus Falls, Soil Conservation Service, and manager, American Crystal Sugar Company, Moorhead, both of Minnesota.

Drainage ditch filled by soil blown in from unprotected land in Red River Valley in Minnesota.

to get it in."

Merlyn Valan, who normally cover crops 200 acres a year south of Moorhead, gives some specific reasons for using the practice:

"It cost me $3,000 to clean out my field drainage ditches last year, because of not seeding a cover crop in the fall. Besides, I had to pay my share for cleaning out the county ditches. This money could have been saved had I seeded cover crops as I normally do. I lost a lot of good dirt too."

And Carl Ehlert, who uses a cover crop on 70 acres in Wilkin County, puts it this way:

"I like cover cropping because it holds soil in place and soil fertility is not lost."

Pres. Hugh Trowbridge of Clay County Sugar Beet Growers Assn. in frozen oats cover.

Wind Erosion Growing Menace To Illinois Farms and Roads

By Homer M. Kuder

FARMERS in central and northern Illinois are using conservation measures in battling the new menace of wind erosion on their rich prairie lands while local and State road and other officials still are counting the cost to the taxpayers of soil blowing damages suffered in late years.

For years they felt that nothing could happen to this good level land. But they have learned that even though wind erosion lies almost dormant some years, it may strike like a plague another year. It struck central Illinois in April 1956, for example, and again even harder on March 27, 1961.

On that day a huge cloud swept across the flat prairie of central Illinois drifting soil like snow. On Illinois Route 116 near Pontiac in Livingston County, motorists turned on their headlights to see through the darkness; and snow plows had to clear off the black soil to allow traffic to move. The whole area looked like a scene from the "Dust Bowl" during the thirties.

Damage was statewide. The soil blew wherever level land had been left bare by fall plowing. The real dollar loss was hard to determine. When this question was put to George Caveziel, Livingston County Superintendent of Highways, he answered:

"This '61 storm cost us thousands of dollars. We just completed work restoring our county roads in 1963. First the dirt was too loose—worse than sand to move—then after it rained it was too sticky and soft. It cost us $100 to $200 a mile just to clear out ditches."

The cost to townships varied, hitting flatter townships harder. Most townships did not receive extra money to cope with the problem; so the big loss was in terms of poorer roads and wetter fields next to the roads. Frank Berberich, former township road commissioner in Collum, said:

"We cleaned out the worst ditches as best we could the first year—many haven't been cleaned out yet."

State highway officials reported that routes most severely damaged cost up to $2,500 a mile to completely renovate.

"We have just now completed cleaning up the highways in this section of the State afer the '61 duststorm," Carl Patelli, State Highway Maintenance Engineer at Pontiac, said last fall. "It was especially noticeable that blow dirt on our roads came from land that was fall plowed."

The author is assistant State conservationist, Soil Conservation Service, Champaign, Ill.

Farmers' share of the wind erosion costs have been heavy. First of all, they lose the most fertile part of their soil, the topsoil testing high in lime, phosporous, and potassium. A more immediately measurable cost is that of cleaning out filled-in drainage ditches and waterways, and the reduction in yields as a result of impaired drainage.

"Shortly after the '61 big blow, I was called to blade out a grassed waterway built just the year before," Berberich recalled. "The waterway was filled to a depth of a foot and a half. This cost the farmer a day's work with a motor grader."

The actual cost was much more, considering that waterways normally last 10-15 years without being reworked.

Ray and Bob Fox of Saunemin are representative of those who have stopped wind erosion damage.

"We don't get any blowing damage on our place," they will tell you. "We developed a conservation plan and carried it out several years ago in cooperation with the Livingston County Soil Conservation District. The Soil Conservation Service helped us install a cropping system with about one-fourth of our land in meadow. With the plan we also installed terraces, waterways, and multiflora rose as a hedge fence. The rose fence is ideal as a windbreak."

Multiflora rose fence near Dwight, Ill., is effective wind erosion barrier and welcome home for song birds and game; and stalks left after corn is picked also give land good protection.

"When we developed the plan," Ray Fox said, "we were most concerned about water-caused erosion on our slightly rolling soils, but now it seems like wind erosion is bothering our neighbors more than water erosion. Our plan has licked both problems. I believe elimination of early fall plowing has had the most effect. We sometimes plow very late in the fall now and have no trouble."

The SCS advised Livingston County District farmers who feel they must fall plow to leave barriers of unplowed strips with standing stubble, 10 or 15 feet wide every 150 feet or so. Fall-seeded oats on plowed land also provides winter cover without interfering with spring work. Rough plowing with some crop residue left above ground helps, if plowing is not done too early in the fall.

If wind erosion continues to plague Cornbelt farmers on the heavy black soil of central Illinois, they eventually may have to adopt stripcropping, field windbreaks, standing crop residues, and cover cropping practices, which have proved so useful in sandy areas, in order to offset the hazards of fall plowing.

This fertile soil blew from plowed field in left foreground, but no soil blew from unplowed field beyond in "big blow" of March 1961.

Here's how the roadside stretch looked 2 years later after the blow soil was removed from road ditch along Illinois Route 47.

Conservation Showplace Farm Not Bothered By Drought Now

By Gilbert G. Bierwagen

The Rittbergers are happy that newly planted windbreak trees are thriving after surviving dry 1960 and 1961.

TO see Rudolph Rittberger's South Dakota farm today one would find it difficult to believe that 30 years ago its principal "crop" was Russian thistle and that the drought of the 1930's almost drove its owner out of farming.

Today, the 320-acre farm on Crow Peak Bench above Spearfish at the northern edge of the Black Hills is a profitable showplace of conservation farming. The soil in the fields of alfalfa, barley, corn, and wheat is among the most productive in the area and has been for years. Rittberger rode out the droughts since the 1930's with comparatively little trouble.

"The fact is," Rittberger says, "it was drier here in 1959-61 than it was in the thirties, but we got through it okay. We even put in a good-sized windbreak despite the dryness."

To do all this would have been unthinkable 30 years ago. Just to hold on through the "dirty thirties" was difficult enough—and impossible for a good many of Rittberger's neighbors.

Rittberger came here in the 1920's as a student at what is now the Black Hills Teachers College. He married the young lady who cooked the meals at his college boardinghouse, and in 1928 the couple settled on an 160-acre tract just above the school. He was a hard worker and had natural ability at farming that were just beginning to pay off when the big drought hit.

The only thing Rittberger and his neighbors could grow was Russian thistle, and even that had a hard time surviving the dust that buried fields and fences, and pushed high against farm buildings. He watched sadly as neighbors pulled up stakes and headed for greener fields. Rittberger himself had to sell off his machinery and stock to hold on. By 1938, however, he already had recovered from the drought sufficiently to buy 80 more acres; and the next year he bought another adjoining 80 acres, bringing his farm to its present size.

When the Lawrence County Soil Conservation District was formed, in 1943, Rittberger saw an opportunity to complete the drought-proofing task he couldn't finish by himself. He became one of the first cooperators and has systematically applied recommended land-use and water-management measures with Soil Conservation Service technical help.

First was to divert a runoff channel that had cut one of his best fields in two, and then shape the 48 acres so he could work it on the contour. Other measures have included using a conservation crop rotation and crop residues; grassed waterways, terracing, and shaping another 65 acres of cropland; planting a shelterbelt around the farm buildings—the last section of which was planted during the recent drought—and building two floodwater and erosion control dams.

These structures feed additional water to springs below and have encouraged Rittberger to plan a

Alfalfa hay being windrowed for baling in October 1963 on Rittberger farm, on which terracing and contour stripcropping have greatly reduced soil loss.

The author is work unit conservationist, Soil Conservation Service, Spearfish, S. Dak.

permanent lake for stockwater, wildlife, and recreation.

Results of this Black Hills farmer's conservation work are told most dramatically in his ledger book: He has boosted income from all crops from one-third to double in some cases, and his land valuation has more than tripled.

He has only had to buy 6 tons of hay since the thirties, even though he has doubled his herd to 22 stock cows, 8 stock heifers, and 2 milk cows. The last 3 years he has just let the hay pile up in the fields for feed during the drought. He also is raising a few turkeys.

Rittberger says conservation has made the job easier and his operations more stable, and has almost eliminated any cause for apprehension he might have over the weather. Conservation farming also has enabled him to provide wildlife with additional shelter and food—an achievement close to his heart.

For years, he has planted most of the tree windbreaks and shelterbelts in the Lawrence County district and has done conservation work for neighboring districts as well. He will go anywhere, anytime, to convince or help convince farmers and ranchers of the benefits of conservation.

Rittberger's conservation work has won him wide recognition. He was second in the Greater South Dakota Association's first-year "Soil and Moisture Achievement Contest" in 1951 and first the next year. He has been named outstanding farmer in Lawrence County several times in the annual Goodyear Soil Conservation Awards Program. And a picture of his farm took first place in the 1963 annual photo contest of the South Dakota Association of Soil and Water Conservation Districts.

The Rittbergers' place is always a main stop on any conservation tour in the area. The Teachers College also uses the farm as a field training site each summer during its conservation training courses.

Colorado Farmers-Ranchers Take Wind Out of Drought

By Mott R. Duncan

FARMERS and ranchers may not be able to change the long-standing reputation of some eastern Colorado areas for proneness to drought but they have succeeded in taking much of the wind damage out of it through conservation treatment and management of their crop and pasture lands.

The drought reputation, gained in the 1930's, was revived in the 1950's; and some landowners, in Baca County in the State's southeastern corner, say the 1962 and 1963 seasons were just as dry, if not drier.

But, although the wind has blown in winter just as hard as before and four-fifths of the dryland crops failed to mature, there was a difference in the seasons just passed: the land stayed put. It remained ready to produce when good moisture returns. That's because a rapidly growing number of farmers and ranchers in eastern Colorado's soil conservation districts are working to see that drought doesn't mean disaster again. A key weapon in their modern battle against drought is the use of crop residues on cropland and improved grass and other cover on range. Stubble mulch is basic in cropland conservation in any year. It is particularly needed in drought.

The short wheat crop in Baca County in 1963 produced less residue than average, and conservation farmers set out to manage carefully the residue they did have. Many planted quick-growing cover crops to protect the land. Some, as an emergency step, resorted to deep chiseling to bring heavier soil to the surface, leaving a cloddy condition that resists wind erosion. Other soil-protecting and moisture-conserving practices, applied on large cropland acreages over the past 2 or 3 years, that helped included terracing, contour farming, striperopping, and crop rotation.

The author is work unit conservationist, Soil Conservation Service, Springfield, Colo.

This is just one of the good irrigated pastures from which Leon Mills has removed threat of erosion damage.

Year-old grass planting thrives on hazardous cropland converted to rangeland by Forrest Homsher (l.).

Many ranchers, meanwhile, reduced their herds, and two moved entire herds to protect their graz-

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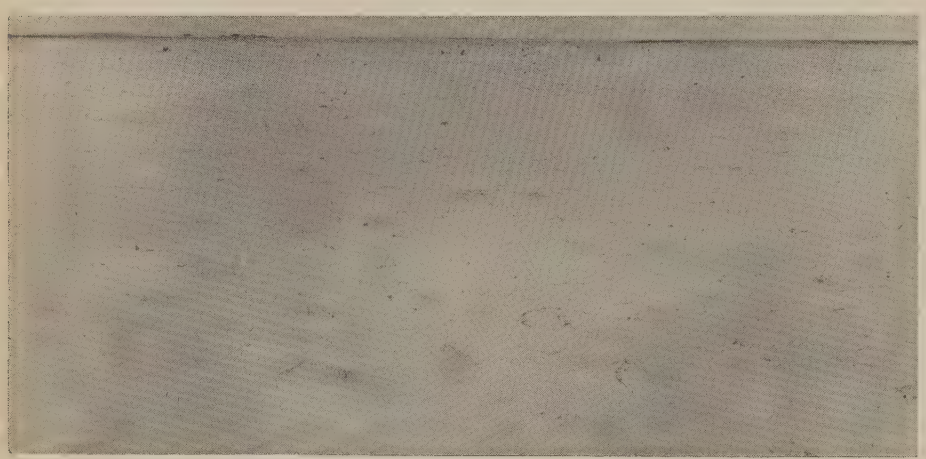

This bare field, remindful of "dust bowl" days, contrasts sharply with neighboring land now protected by conservation practices.

Heavy stubble protects the land of Bernard Neill (l.) near Springfield, Colo., and of his Southeast Baca SCD neighbors. Mott Duncan of the SCS (r.).

ing land. Other practices Baca County ranchers had been using for years which paid added dividends in the emergency included deferred grazing and pasture rotation, cross fencing, brush control, reseeding rangeland, and stockwater ponds spaced to insure uniform grazing.

Much of the recent conservation work in the three soil conservation districts that serve Baca County —Two Buttes, Western Baca, and Southeastern Baca—has been carried out with the aid of Federal cost-sharing and technical help of the Soil Conservation Service available through the Great Plains Conservation Program. Through it farmers and ranchers are planting dunes and blowout areas—land believed to have been destroyed by drought 30 years ago—to trees, shrubs, and other cover.

Forrest Homsher and others tied marginal cropland down by seeding converted cropland to grass under this program; and Roy Hanes, first in the area to enter the Great Plains program, in 1958, decided to sell most of his livestock and rebuild his herd as he rebuilds his range.

Fred Miser, who has ranched in the area for nearly 40 years, cut back his herd by 100 head of cows in August. J. M. Welborn is one who moved his herd to the northern part of the State. George Lapel established a good grass cover on his 500 acres of rangeland after controlling moisture-hogging sagebrush with chemical spraying. Leon Mills improved 220 acres of irrigated pasture, virtually eliminating the danger of wind and water erosion.

Bernard Neill and Clarence Seawright are among those who place great weight on stubble mulching. Seawright uses it on 2,000 acres of cropland, virtually all of which is terraced to make the most of the moisture available.

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Soil Conservation

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25 Years Ago

"The biologist seeks to turn wasted parts of farm and ranch to the benefit of wildlife by covering the wounds of erosion with healing vegetation. He has developed techniques of great value to farmers for stabilizing critically eroded areas. At the same time, his success in improving conditions for wildlife has been the means of pointing out to many people the importance of soil defense as the basis of all conservation.

"These are accomplishments already credited to the biologists; but biologists as well as all other technicians, will need to exert themselves still more in the future . . . Much needs to be done to improve our present conservation practices and apply them most effectively in the solution of flood-control, water-facilities, drainage, farm-forestry, and drought problems.

"The development of soil-conservation districts makes possible the coordination of individual, State, and Federal forces for the conservation of soil and its resources, of which wildlife must always be reckoned as one."

COVER PICTURE.—Dave Smith is the young fisherman hoping to catch a hungry rainbow trout, bass or croppie at sunset from 60-acre irrigation storage reservoir on Stan Waneka land, which also is licensed game preserve and nesting area for migratory ducks, near Lafayette, Colo.—Photo by W. A. Smith.

VOL. XXIX, NO. 8 MARCH 1964

CONTENTS

Page

171 Recreation Has Important Part in Land's Use
By Donald A. Williams

173 Alabama Brothers Switch From Row Crops to Recreation
By Jimmy Holland and Walter S. Allen

175 It's Maple Syrup Time Again!
By Donald D. Kline and Marvin F. Bureau

177 Massachusetts Campers Learn About Conservation
By Bernhard A. Roth

178 Georgia Conservation Farm Lake Serves Four Counties
By Walter S. Allen

180 Conservation Increases Feed for Teton Elk Herd
By Arthur F. Halloran and Roy H. Buchmeier

182 He Holds Water on the Land for Sake of Wildlife
By Charles W. Skaife

183 Bird Feeding Leads Virginian into Hunting Business
By N. L. Ramsey

185 Washington Rancher Adds Recreation and Wildlife
By Gordon F. Stubbe

187 Farm Ponds in Smokies' Shadow Yield Trout
By Sellers G. Archer

189 Kansas Watershed Lake Gives Up Record Bass
By Elbert L. Bell

190 Pay-As-You-Shoot Hunters Pay Off for New York Farmer
By F. E. Mulvaney

192 Book Reviews

Soil Conservation

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Recreation Has Important Part In Land's Use and Conservation

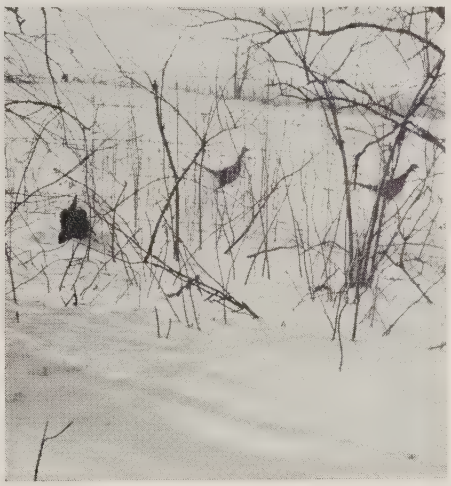
By Donald A. Williams

TODAY, our land has taken on totally new values. These include the productive source of our food and other living essentials, watershed areas subscribing community stability and well-being, recreational space and wildlife habitat, wilderness or other unspoiled natural areas for the reflection and enjoyment of our Nation's citizens, and living and industrial working space for 190 million people who are increasing their numbers by some 2¾ million each year.

In this dynamic age, we cannot afford to forget the fundamentals of conservation that underlie good land use and conservation. Most importantly, they include the principles of human interests and needs—recognition of the fact that the people who use the land, whether for farming, hunting and fishing, or camping, are the key to its future fate.

One of our great needs today and in the future is to apply on all lands—farm and pasture lands, forest lands, wildlife and other recreational lands—the same basic principles that have proved sound in more than a quarter of a century's experience in soil and water conservation. Therein we have the best assurance of the maximum possible preservation and future enjoyment of all out-of-doors.

We need to shift uses of land within the agricultural plant itself to create a balance between production and need. However, shifts of cropland from crops now in surplus to uses that meet the needs of all Americans must be made in ways that will reward the farmer and not cut his income.



Land use for game: Pheasants in March on Davis Warren's DeKalb County, Ill., farm mean good shooting come fall.

Recreational use of land is one approach to helping meet the needs of all the people.

Our public land recreation facilities—even though they will continue to grow in number and in use—will not be able to keep up with the booming demand for outdoor recreation. The demand can be met, however, on privately owned lands—the farms, ranches, and woodlands that make up nearly three-fourths of our land area. In short, there is a place—actually, a crying need—for both public and private recreational facilities.

That is on the purely mathematical basis of the people's increasing demands for more and more land and water space for outdoor sports and recreational activities of many kinds, without taking into account the more compensating use of extensive acreages for recreational purposes instead of for uncertain or unneeded crop production.

Small-watershed projects across the land have produced an entirely new source of water-based recreation on the small lakes created by flood-prevention dams.

And the 1962 Food and Agriculture Act provided amendments to the Small-Watershed Program that authorize cost-sharing for recreation developments. Federal loans may also be made for the local share of the costs. This new provision has brought enthusiastic response. Proposals have been received in our Washington office for about 70 recreation developments in about 60 watershed projects in 30 States.

Small-watershed projects are an excellent new way to provide additional needed public recreation areas. Watershed project recreation developments are necessary and desirable, but they are only one answer to augumenting the Nation's recreation needs.

A 3-year study by the Outdoor Recreation Resources Review Commission revealed that the simple outdoor pursuits, not the sports and games and the commercialized activities that require expensive facilities, are the most popular. Urban people are most interested in getting away from noisy crowds where they can relax in solitude and enjoy the outdoors. The most popular activities are picnicking, swimming, sightseeing, walking to scenic points, photography, sunbathing, camping, and trail hiking.

All these activities require room

—Abstract of talk by the Administrator of the Soil Conservation Service at the annual meeting of the New York Soil Conservation District Association, Rochester, N. Y., December 5, 1963.

on the land. The more intensive forms of recreation, those requiring playing fields and amusement parks, take exclusive occupancy of the land devoted to them. Others, like camping, hiking, hunting, or sightseeing, can be incidental uses of cropland, pasture, or woodland, and can be combined in various patterns of multiple use on rural land. Thus the simple types of outdoor recreation are at the same time the most in demand and the easiest for farmers and other rural landowners to incorporate into their regular operations as an additional source of income.

Outdoor recreation thus enters the conservation planning process in soil conservation districts as alternative land use or as a multiple land use. A landowner can both dedicate certain lands entirely to income-producing recreation and install certain measures that combine recreation and other uses on the same piece of land. Outdoor recreation is indeed a new economic product of the land, one that has potential for raising farm family income and for strengthening the rural economy.

Soil conservation districts for years have been assisting land owners and operators in the use of land and water in ways that increase fish and wildlife and create pleasant surroundings for outdoor recreation. More than a million farm ponds and lakes and many other conservation practices that contribute to the interest and beauty of the rural landscape already are being used by farmers as a basis for income-producing recreation.

Boating and other summer sports are not far off on Lake Malone formed by a multiple-purpose dam on Kentucky Department of Fish and Wildlife property in Mud River watershed project near Dunmor.

In the fiscal year 1963, more than 9,800 district cooperators established one or more recreation enterprises, and 9,000 planned to install one or more such enterprises. Of the national total, 945 installed recreation enterprises as a primary source of income.

These are ways in which we have been improving outdoor recreation resources in our regular work in recent years. The Food and Agriculture Act of 1962 authorized additional and specific assistance to farmers and other landowners in developing recreation enterprises for profit, and Secretary Orville L. Freeman has directed the agencies of the U. S. Department of Agriculture to increase their assistance under older authorizations. He assigned to the Soil Conservation Service leadership for the Department's income-producing recreation activities and for liaison with other Federal and State and local agencies assisting with recreation development.

Resource and Conservation Development Projects also offer possibilities for recreation development. These projects may cover several adjoining counties or

Recreation pond brings Bill Austin of Osborne County, Kans., additional income from selected fishing permit holders, who also may hunt waterfowl and upland game birds.

These strips of short-stemmed sorghum and natural grass provide food and cover for wildlife and walking lanes for hunters on hunting preserve near Manassas, Va.

watersheds, and must be locally initiated and sponsored, as by soil conservation districts.

The 1962 act also authorizes loans through the Farmers Home Administration to farmers and rural groups for developing income-producing recreation enterprises. As of January 22, 137 farm operators had borrowed a total of $1,048,693 to develop picnic and camping grounds, shooting preserves, and to build lakes for fishing, swimming, and boating. Twenty-seven nonprofit associations had borrowed $2,409,570 to finance larger recreation projects, bringing total recreational borrowing to $3,458,263.

Cost-sharing is available to farmers through the Agricultural Conservation Program for specific conservation practices of benefit to wildlife and recreation.

These are the tools the Department of Agriculture has to offer in the development of outdoor recreation, as an important contribution, also, to our common goal of Rural Areas Development through which Department of Agriculture agencies are focusing all available resources in each community on the central objective of sound economic development. Recreation is only one of the many new aspects of land use and conservation that face us today, but it is highly important among the rapid changes now taking place in agriculture and in land and water use.

Alabama Brothers Switch Farm From Row Crops to Recreation

By Jimmy Holland and Walter S. Allen

ALABAMA brothers James and Eulon Enfinger have given a new rural area development twist to farming in Geneva County by converting their row cropland to recreation and related activities.

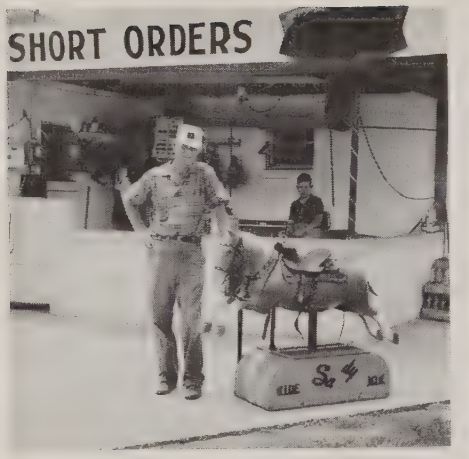
At their Hartford Lake you can:

Fish from the bank or a boat, buy a hot dog or a catfish dinner, see a horse show, swim in a modern pool, or attend a dance.

Hunt quail, ducks, and doves on several hundred acres nearby.

Things are quiet here around the Enfingers' 60x100-ft. swimming pool, but on summer days it's a different story.

The authors are work unit conservationist, Geneva, Ala., and field information specialist, Sparatansburg, S. C., both of the Soil Conservation Service.



Brother James makes sure Enfinger brothers' concession stand is all set for day's business.

Gene Hallford of Slocum, Ala., on his quarter horse in show ring.

And, soon, leave the children in a supervised playground or take them on a motorized float ride on the lake, enjoy miniature golf, picnic, and camping facilities, and spend the night in a lakeside lodge.

The Enfinger brothers say it beats plowing cotton and corn.

"We're making twice as much as we did row-cropping, and we're enjoying it more," as James puts it.

The Enfingers revised the conservation farm plan on their 540-acre farm in 1959, with help of the Soil Conservation Service through the Geneva Soil Conservation District. Heavy rains had made gullies in their fields and washed away valuable topsoil. They took 232 acres out of row crops and put it into bahiagrass and Coastal bermudagrass.

Water from a creek they dammed up and from several springs, plus runoff, soon formed a large lake, which they stocked with fingerling bass, bluegill, shellcrackers, and channel catfish obtained through the district from the State Department of Conservation. At the grand opening in the summer of 1959, 5,000 people turned out, 2,100 of whom paid to fish or rent boats.

The brothers and their wives opened a restaurant at the lake and specialized in serving catfish and "hush puppies." They put up roadside signs. Pretty soon, the word got around; and church, school, civic, business, and industrial groups began making reservations for supper meetings at the lake.

The Enfingers built a 60 x 100-foot swimming pool, dressing rooms, a recreation hall, and a concession stand. They bought 50 boats and rented them at $1 a day. Fishing fees were the same price. Some 250 people paid the 45-cent swimming fee last July 4 to use the swimming pool. Bathing suit rentals brought in more money. At the concession stand, visitors bought food, fishing equipment, and bait, or rented boats and fishing gear. Even fishing and hunting licenses are sold.

Last summer, fishermen coming to Hartford Lake averaged 100 a week, and numbered as many as 200 in a day on special weekends. The brothers closed the lake for fishing in July to drain, clean, and restock it. They will reopen it next May.

The Geneva County Sheriff's Posse established a show ring at Hartford Lake and put on its first show last August 3. Hundreds saw Tennessee walking horses and quarter horses from several States perform. The show will be a regular event at the lake.

The Enfingers planted browntopmillet in the nearby marshy areas for ducks and doves, and cowpeas and bicolor for doves and quail in the fields and edges of wooded areas. During the season, groups hunted, by reservation, at $1 a day for each hunter.

The brothers' expansion plans for a year-round recreational center include a miniature golf course, a children's playground, a motor-powered float, lakeside overnight lodges, another dining room, picnic and camping facilities, additional boat docks, and a separate duck pond. They also plan to put some beef cattle on their pastureland.

"We don't have a labor problem like we had on the farm before," James Enfinger says of their converted recreation center farm. "We can do all our work at the camp. I like to look after the lake, boats, and other outdoor activities. Eulon enjoys preparing the fish and things like that. The ladies sure help, too."

"Our business now is a cash crop," Eulon adds. "We don't have to wait until fall to collect on it."

The Enfingers' recreation center already has been attracting people from at least a 50-mile radius, including Geneva, Houston, Coffee, and Dale counties. It is filling a need in the area for recreational facilities and is boosting the economy of the county.

"This project is rural area development in action," SCS conservationists have observed, pointing out that the U. S. Department of Agriculture's Rural Areas Development effort is geared toward helping local people help themselves by developing diversified uses of their land—such as the recreational project that has been so successful for the Enfinger brothers.

IT'S MAPLE SYRUP TIME AGAIN!

By Donald D. Kline and Marvin F. Bureau

MORE farm families in the sugar maple areas of the Central and Northeastern States are finding that conservation treatment and management of their "sugarbush" lands pay off at this early-spring sap-collecting and syrup-boiling time.

They may be the exception that proves the rule in the face of a longtime downward trend in production of one of the oldest American farm products—from a high of 5,564,000 gallons of syrup in 1918 to a low of 1,053,000 gallons in 1945 and 1963's fourth-lowest total of 1,145,000 gallons. To them and their communities, maple syrup is a welcome source of off-season income and business, with an average price of just above $5 a gallon received by the farmer-producers for their 1963 syrup.

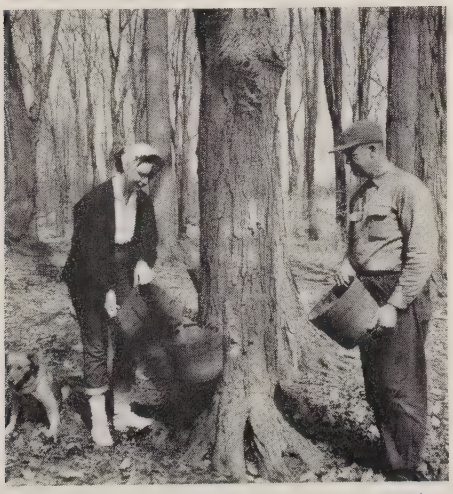
The authors are soil conservationist, Grand Rapids, Mich., and soil scientist, Wooster, Ohio, both of the Soil Conservation Service.

Principal beneficiaries of this income have been in Vermont, New York, Ohio, Pennsylvania, Michigan, Wisconsin, New Hampshire, Massachusetts, Maine, Maryland, and Minnesota, with other States sharing to a lesser extent.

And properly managed maple groves, grown alone or along with harvestable timber, constitute safe and profitable use of hilly and other sloping lands not suitable for cultivation or intensive grazing, especially as planned with technical help of the Soil Conservation Service through soil conservation districts.

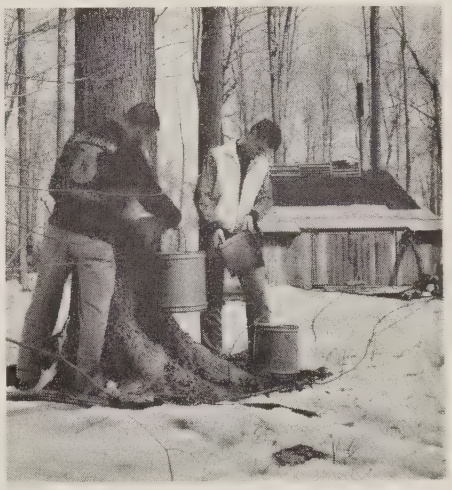
When the sap is rising and sugaring time rolls around, the centuries-old pastime of working in the sugarbush gets under way, by old methods and new. Some growers still haul in the sap by horse-drawn sled to the open boiling kettles. But modern harvesting and processing equipment includes flu-type evaporators, and even plastic hose lines hooked up from the tapped trees in a self-operating gravity system that carries the sweet sap to a central collecting tank.

Melvin Robinson in Sparta Township in Michigan's Northwest Kent Soil Conservation District is one of those who uses old-fashioned buckets in his 16-acre sugarbush. More than 100 years old, they were brought out from New York State by the former landowner. In Wayne County, Ohio, Chairman O. L. Weygandt of the Wayne Soil and Water Conservation District board of supervisors uses more than 1,000 buckets to collect maple sap from his own and neighboring sugarbushes. Both are representative of today's operators who are managing their woodlands by conservation meth-



Gayle Robinson helps her father with the March sap run.

Hard maple seedlings on Wieland's Michigan farm.



Caledonia, Mich., FFA boys collecting maple sap in leased sugarbush.

Weygandt collecting maple sap in his Ohio sugarbush.

His maple syrup evaporating shed is almost obscured by wood ready to be sawed and split for market.

ods, to assure the most profitable production of sugar and timber products.

Take Robinson's operation:

When he became a cooperator with the district in 1962, he excluded cattle from his woods, because pasturing over the years had compacted the forest floor to the point that there was little chance for maple seedling reproduction. He also will remove all the intermixed beech trees except a few squirrel den trees.

In Kent County, as in many other places, timber buyers often have cut only the choice hard maple and left weed trees and culls competing with younger trees.

"It has taken 12 years for our hard maple seedlings to come back," says George Wieland of Lowell, a cooperator in the Northeast Kent Soil Conservation District since 1952.

He has giant, four-log trees in his 12-acre woodlot, but there is a lack of sapling and pole-size growth for profitable production later on. Each year Wieland decides how many mature trees he will harvest for timber. Among them are "overmature" trees, past their prime for best grade lumber, but some of these "three-bucket" trees will be left to tap.

Other Kent countians have an interest in maple syrup besides using it on their pancakes and biscuits. The Caledonia Future Farmers, for instance, manage two sugarbushes as a chapter money-making project. The 40 students put $480 into their treasury from syrup sales in 1963. Chapter Adviser William Harrison uses the school's woodland for firsthand experience in forestry projects, with emphasis on conservation management.

Conservation on his farm woodland has led Weygandt right out of a 43-year dairy farming career in Ohio into a thriving full-time firewood and maple syrup operation. Weygandt has been using conservation practices since 1939 Civilian Conservation Corps days, and had a complete soil and water conservation plan in 1949 for the dairy farm he was renting.

Maple syrup production had been a Weygandt sideline activity for many years but had to be limited because of the demands of dairy farming. Today on his own 61-acre farm, Weygandt is well on his way to developing another complete soil and water conservation plan, with the major emphasis on intensified woodland management for marketable tree products.

This plan called first for improving the existing 29 acres of timbered slopes. Included was removal of grapevines and inferior mature or overmature trees, along with improvement cuttings in the sugarbush to favor the hard maple for syrup production. The steeper areas on his other 32 acres of sloping open land are being planted to hard maple as outlined in his woodland conservation plan; while the less sloping areas are being developed into permanent grassland, now being pastured by nearby son Harold's stock.

With an expanded fireplace wood and maple syrup market, Weygandt now contracts with nearby farmers for additional

woodland products. In 1963, more than 800 cords of custom-cut fireplace wood was obtained from improvement cuttings in his own and surrounding woodlands and wholesaled to Cleveland dealers. An additional 50 cords of scrap was marketed locally as furnace wood. And more than 8,000 board-feet of saw timber was harvested from Weygandt's own woodland recently, with another cutting near the same amount expected in 1964.

"This gives me a real opportunity," he says with obvious satisfaction, "to assist others in applying woodland conservation while providing them with a ready cash return."

Syrup production from the maple sap collected from his own and neighbors' sugarbushes has averaged a sweet 325 gallons a year. Management practices recommended in his woodland conservation plan are being followed to assure maximum quantity and quality sap production.

For his overall woodland operation, Weygandt employs one man year-around, and up to six more during the busiest times. Sugarbush activities don't compete with other labor requirements, because they come in the early spring, but studies in Michigan and other States show that syrup production is one of the most profitable farm enterprises for the time spent. It often pays $3 an hour, even including time spent in cleaning the equipment and collecting and boiling the sap.

As long as maple trees are grown for timber, working in the "sugarbush" may be counted upon to be a part of the American scene. And, in spite of modernization of harvesting and processing in this strictly on-the-farm syrup-production business, there still will be much hustle and bustle when "sugaring-off" time comes in the spring; and neighbor boys invariably will sneak away from their own chores to help stir the lucky sugarbush farmer's sweet, pungent sap and linger to scrape the bottom of the boiling pan clean of its taffy-like sugar.

Massachusetts Campers Learn About Resources–Conservation

By Bernhard A. Roth

MASSACHUSETTS family and other groups who visit Camp Elbanobscot in Sudbury are exposed to firsthand lessons about the land as it is used by the campers themselves and by the wildlife and plants around them.

Camp Director Basilla Neilan tells about the larger purpose of the year-around camp on the Sudbury River in country renowned for the stand of the Minute Men at Old North Bridge in 1775 and for the writings of Henry David Thoreau.

"Camp Elbanobscot has its program geared to one of present-day society's acute needs—the conservation of our basic resources of soil, water, woodland, and wildlife," Miss Neilan explains. "Faddism has had its heyday in the form of camps that have plugged away slavishly at everything from ballet to baseball, or whatever else seemed to catch the popular fancy. Too many golden moments have been thus squandered—moments when young and old campers could have gained an appreciation of the wonders and sciences of the environment where camps are located."

During the summer there are 200 day and resident campers and a staff of 40. Junior counselors in training, after a qualification period, transfer to other camps throughout the country, taking with them a fervor for conservation stewardship.

The natural wonders of the Sudbury River Valley are fully capitalized in Elbanobscot's schedule. In keeping with the camp's larger purposes, a conservation plan has been developed in cooperation with Soil Conservation Service technicians working with the Middlesex Soil Conservation District. The plan emphasizes woodland management, tree and wildlife shrub planting, and the establishment of field borders for wildlife food and cover.

Director Basilla Neilan (center) discusses camp conservation activities with William Coates (l.) and R. Morehouse of SCS.

Directors of the nonprofit Elbanobscot Foundation built a pond after becoming cooperators with the Middlesex district. With a ½-acre surface and 18 feet at the deepest point, the pond has a dock, swimming cribs, and a raft. A berm 5 feet high was built around it to prevent flood damage during high water peaks in the nearby river. The turf on a 6-acre playing field is pump-irrigated from the pond.

The author is field information specialist, Soil Conservation Service, Upper Darby, Pa.

The half-acre pond at Camp Elbanobscot is well equipped with life-saving devices.

Elbanobscot's resource protection program also contributes to the effectiveness of the SuAsCo River small-watershed protection and flood prevention project, sponsored by the Middlesex and Northeastern Worcester County soil conservation districts.

Activities in conservation and the natural sciences at Elbanobscot are under the direction of Miss Mary E. Sherwood, for many years a director of the Massachusetts Audubon Society's field staff. The 110 acres of glaciated terrain, ranging from river-front marshland to the top of 120-foot-high Weir Hill, provides outdoor laboratories for conservation research.

Comparisons in plant and wildlife environment accordingly are open to her campers as they climb from the river's edge to the top of a glacial kame formation. Nearby are more than 4,000 acres of State and national wildlife management and refuge areas.

Trails were planned to expose profiles of underlying soil in relationship to land as used by vegetation, wildlife, and the campers. Minature diversion terraces protect footpaths and sloping campsites and groves. Observation and photography blinds have been set up to achieve a closer look at and record of the wild creatures in the camp's abundant wetland.

Among the most enthusiastic conservationists at Elbanobscot are handicapped youngsters from Boston and the surrounding area. The staff teaches the blind the joy of identifying—by smell and touch—and understanding the role played by trees and plants, birds, and mammals.

It is one more way in which natural resources and their conservation are stressed at this Massachusetts camp beside the storied river where the Nobscot Indians were campers in days gone by.

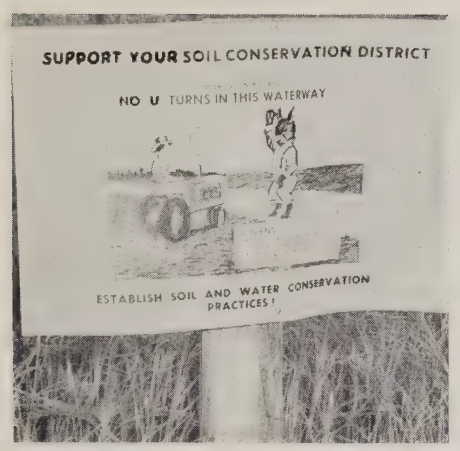
Georgia Conservation Farm Lake Serves People of Four Counties

By Walter S. Allen

PEOPLE of four central Georgia counties bless Banker-farmer A. T. Land, Sr., for the free fishing and picnicking that town and country groups enjoy at a conservation lake and lodge on one of his farms near Allentown.

Groups that use the farm's recreational facilities include Sunday schools, civic and garden clubs, and Parent Teacher Associations and other school organizations, in addition to farmers and businessmen and their families. They come from Wilkinson, Twiggs, Bleckley, and Laurens counties in the area. Land, who is president and chairman of the Board of the Four County Bank of Allentown and a successful banker, farmer, and businessman, says he enjoys helping his neighbors

The author is field information specialist, Soil Conservation Service, Spartanburg, S. C.



This sign makes its point in one of Land's Coastal bermudagrass waterways.

help themselves and making his community and the general area a better place in which to live.

"Land is a good friend of mine," runs a typical observation by his guests. "In fact, I fish at his lake every chance I get, and we have our church picnics at his lodge all the time. He's one of the finest men I know."

Or: "Land let me have a loan down at his bank that got me started farming. He helped us build our church."

Land built the lake about 15 years ago and permitted the people of the area to fish in it. When he completed the enlarged 40-acre lake 4 years ago, with the technical help o the Soil Conservation Service in Bleckley County, he expanded the recreational facilities and made them available to the surrounding communities.

The Lands live in the same house where he was born 63 years ago, son of an Allentown merchant. He started working in a bank at nearby Danville when he was 17 years old. Now, their older son, A. T. Jr., is assistant vice-president of his father's bank; and another son, Irwin W., a senior at the University of Georgia, also plans to enter his father's banking and farming business. Land also is president of a warehouse company and owns a cotton gin.

He is chairman of the Board of Stewards of the Allentown Methodist church. He has served on the Wilkinson County Board of Education, in the State Legislature, and as a supervisor of the Central Georgia Soil and Water Conservation District.

Farm people of the area look to Land and his bank for leadership and financial help. They find not only assistance but inspiration.

He believes in soil and water conservation and puts his beliefs into practice. Ride through any of his farms and you'll see evidence of good conservation farming. As you drive over the well-planned field roads on the ridges and on the contour around the slopes, you'll see parallel terraces, pine trees, lakes, grassed waterways, and sleek Hereford cattle grazing on acres and acres of green Coastal bermudagrass.

Wilkinson County Farmer Eugene Williams (l.) consults with Banker-farmer Land.

"There's no program in which we can invest our money that will pay better dividends than in soil conservation," Land says. "The farms in this area are worth three or four times what they were when I was a boy. Farmers are eager to improve their property when given the opportunity. Tree farming and pasture improvement have moved forward here because of soil conservation, and lots of land has been taken out of row crops and put into grass. And that has brought about more livestock, one of the best investments you can have."

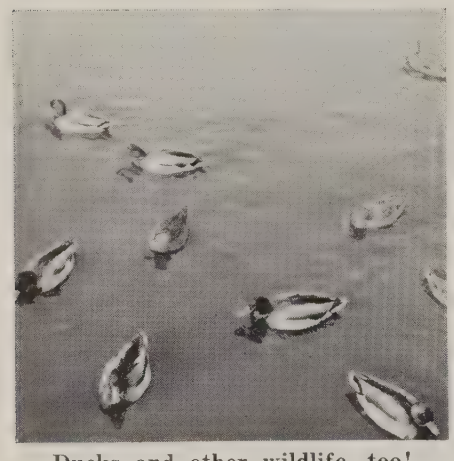
His lake and lodge are examples of good planning to make the best use of his land. At one time, the area was too low and wet to plant row crops, or even for pasture development. Now, it is paying off in dividends that can't be added up in a bank statement—opportunities for relaxation and enjoyment for his neighbors and friends that otherwise might never have been possible.

"Fishin' is good" in Land's conservation lake.

Conservation Increases Feed For Hungry Teton Elk Herd

By Arthur F. Halloran and Roy H. Buchmeier

Hay by the ton—elk by the thousand!



Ducks and other wildlife, too!

A COOPERATIVE conservation feed-production program is helping to head off what could have been disastrous results of a continuing population explosion in the famed Jackson Hole Elk Refuge at the foot of the majestic Tetons in western Wyoming.

Between 7,000 and 11,000 elk congregate each year in the 25,000-acre snowlocked valley. Also during the year thousands of ducks, Canada geese, and swans swim on or nest beside trout-filled Flat Creek, and small game likewise abounds. Yet, only a half a century ago, the famous elk herd was well on its way to extinction from starvation or slaughter by the settlers, who cut the elk off from their traditional feeding grounds by fencing for their domestic stock.

Farsighted local people brought its plight to national attention; and in 1912 Congress authorized the National Elk Refuge for protecting and feeding hungry elk herds drifting down from the surrounding mountains. In the 50 years since, the size of the herds has increased steadily, and the problem of feeding them has mounted proportionately.

Wildlife experts say game is more plentiful in "the Hole" today than it was 100 years ago, when it was known far and wide as a hunting ground for Indians and whites alike. The elk refuge, which is visited by more than 100,000 people a year, is administered by the U. S. Fish and Wildlife Service's Bureau of Sport Fisheries and Wildlife. The Bureau works closely with the Soil Conservation Service to provide enough food to keep the massive elk population fed and healthy during the winter months.

Hay stored for winter feeding is raised on the refuge; but it has to be supplemented with another 2,500 tons annually which the Bureau of Sport Fisheries and Wildlife raises on nearby National Park Service land and is harvested under contract by the Wyoming State Game and Fish Commission. Most of the hay is stored in and alongside 12 scattered sheds holding 500 tons each; but much of that harvested within the refuge is left in rolled bales on the ground. When they are turned loose in these fields, the elk make short work of scattering the bales with their antlers.

For weeks before and after the snowy midwinter baled hay feeding period, the elk feed on the native grasses, forbs, and marshland vegetation; but as the herds get larger and hungrier, more food is needed. Because no more land is available for cultivation, more pounds of native feed per acre must be produced.

To that end, the refuge entered into a cooperative agreement with the Teton Soil and Water Conservation District, and SCS technicians made a detailed survey of the land in 1958. As rapidly as this information became available, plans were drawn up to apply it to the land. The refuge land was divided into 10 complementary units to facilitate planning, and land-improvement recommendations were spelled out in detail, ranging from miles of water-spreading ditches to types of grasses and methods to be used in reseeding. Hundreds of new irrigation structures have been built, and more are to be installed.

The program also includes conservation crop rotation, use of crop residue, and management practices. Water is spread over once-sparse grasslands in 31 miles of ditches dug so far with a road grader, permitting more uniform grazing and better protection of the land.

The authors are wildlife management biologist, Bureau of Sport Fisheries and Wildlife, Cache, Okla., and work unit conservationist, Soil Conservation Service, Jackson, Wyo., respectively.

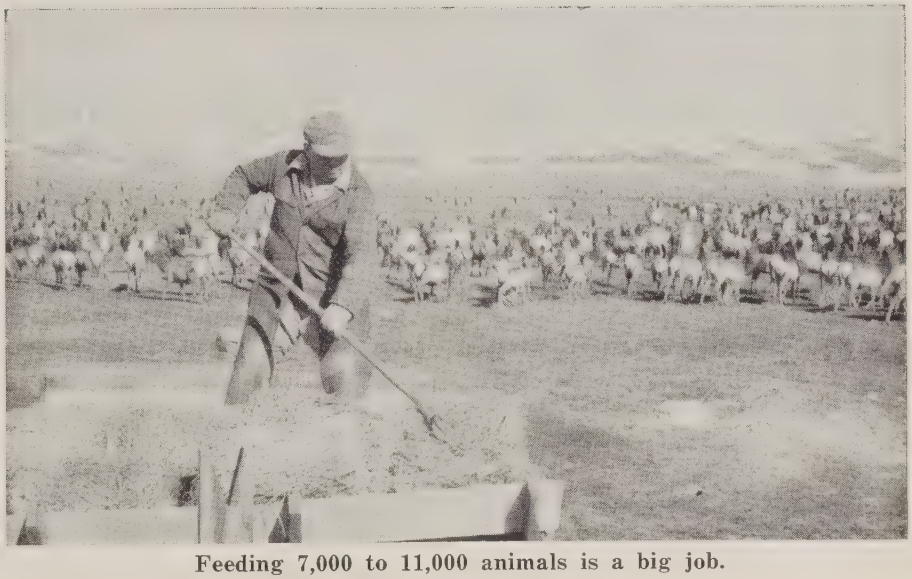
Other jobs already completed include weed control; 534 acres of land leveling; 12 ponds, which also improve both irrigation and grazing efficiently; and nearly 1,000 other irrigation and water-control structures installed. These improvements are increasing hay production. Hayland planting has been completed on 645 of the nearly 3,000 acres planned for it.

Range seeding is still required on more than 1,200 acres, and 1,500 acres of rangeland still needs water-spreading ditches. Nearly 300 more acres of land leveling is needed, but 656 of the 3,040 acres scheduled for rough land smoothing has been completed. About half of the planned 25 ponds have been built, and about 20 more miles of ditches are to be added, among measures yet needed. Application of these practices in the detailed conservation program is facilitated by a master plan which enables the Federal agencies to schedule each year's work in detail and to the penny.

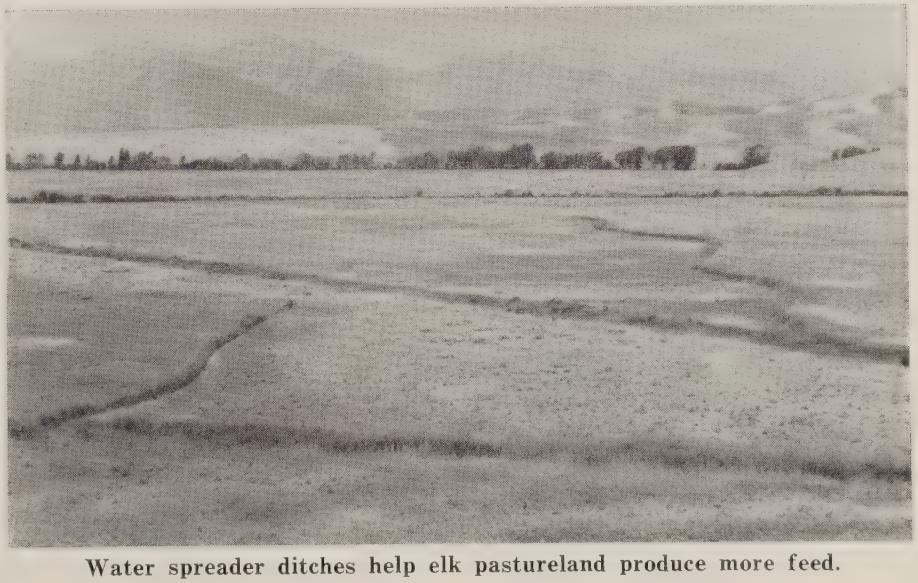
Although keeping up with the elk population is the main objective, many of the water structures complement the marshland habitat for ducks, wild geese, and the rare trumpeter swan. Marshland improvement is being undertaken to raise the water table for better nesting and spawning.

In addition to the elk, moose, mule deer, and mountain sheep are frequent visitors. In the higher reaches, sage hens lead their young along the clear, snow-fed streams stocked with trout from a hatchery on the refuge that serves this general area. Blue and ruffed grouse find sanctity in the back-country hills. The national bird, the bald eagle, wheels over the game-filled buttes. Owls, beavers, and countless other lesser birds and animals call Jackson Hole home, where the many animals of the wilds now have better than a fighting chance for survival—thanks to conservation and good land and wildlife management practices.

Winter snow means hungry elk at Jackson Hole.



Feeding 7,000 to 11,000 animals is a big job.



Water spreader ditches help elk pastureland produce more feed.

He Holds Water on the Land For the Sake of Wildlife

By Charles W. Skaife

IRVING PERKINS is a collector. He collects water. Perkins collects water because he likes wildlife.

His farm, at Oconomowoc, Wis., is in an area where drainage is a major problem for most farmers. Waukesha County is also one of the fastest growing counties in the State. Farmland is giving way rapidly to subdivisions, superhighways, and supermarkets.

Surrounded by all this development, Perkins is quietly developing his 800 acres for the use for which it is ideally suited—wildlife. He holds all the water he can on his land; and, as a result, his farm is a sanctuary for birds and animals. They include deer, mink, fox, badger, raccoon, skunk, possum, muskrat, rabbit, squirrel, pheasant, partridge, quail, ducks, and a host of song birds.

Perkins obtained the farm from his father and has lived on it all his life. From 1925 until 1945, Perkins worked for the Milwaukee Public Museum as a zoologist and taxidermist, gaining a wide knowledge of birds and animals which he later put to practical use on his farm.

He is a cooperator with the Waukesha Soil and Water Conservation District. To bring his low land and pothole land into full wildlife production, he built four ponds and 400 rods of water-holding dikes. Where possible, he diverts runoff water toward his pond areas.

A Soil Conservation Service soil survey showed that 500 of the 800 acres were well suited for wildlife. Much of the area, particularly the potholes, has a high water table; but during drier periods water formerly receded a couple feet below the surface.

"Every spring," Perkins recalls, "teal and mallard ducks came to these potholes to nest and hatch their young. Soon after that, the surface water would disappear and that was the end of the ducklings. We used a dragline to deepen these areas, and used the spoil for dikes to retain the water. Now, with these ponds, we have a good home for ducks and many other water-loving creatures."

Soon after the first pond was built, deer from the larger wooded marsh areas came out to drink. Muskrats appeared and began using the spoil for their dens. There has been no livestock grazing on the farm for the past 25 years.

"We noted a considerable increase in the number and species of wildlife 3 years after we discontinued grazing," Perkins says.

To improve the habitat for game and song birds, Perkins is setting out conifers for cover and high bush cranberry, dogwood, and elderberry shrubs for food, obtained from the Game Management Division of the Wisconsin Conservation Department. He rents out about 100 acres of land suitable for tilled crops, but the financial mainstay of his operation is a flock of 6,000 pheasants.

Perkins and his wife started their pheasant-raising project in 1925. The pheasant range is fenced; but Perkins releases birds on his land during hunting season, and many fly to neighboring farms or hunting grounds. The Perkins' selectively bred pheasants also are sold as breeding stock, are used at

Contractor enlarging pothole for Perkins' wetland development.

The author is work unit conservationist, Soil Conservation Service, Waukesha, Wis.

Perkins watches while one of his many young friends tries to catch a bass.

dog trials, and are dressed out for restaurant and home cooking.

Because of the Perkins' contribution to pheasant development, they were cited in 1961 by the Pheasant Fanciers Game Breeders and Aviculture Gazette and awarded "The Feather of Distinction" for outstanding service in the world of aviculture. In 1962 Perkins was recognized by the Waukesha Kiwanis Club for his outstanding accomplishments in soil and water conservation.

Mrs. Perkins holds large pheasant while Perkins shows "midget" bird.

Bird Feeding Leads Virginian Into Hunting Lodge Business

By N. L. Ramsey

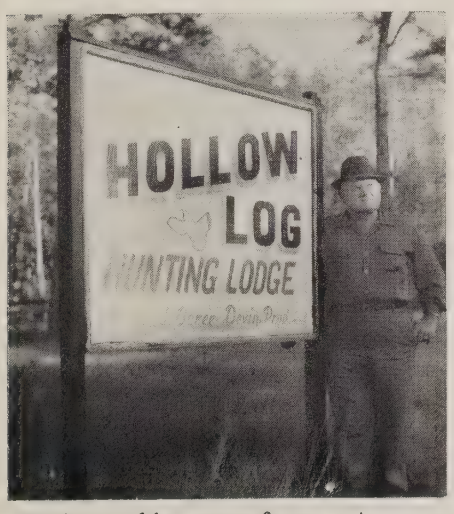
A WINTER bird-feeding urge that Virginia Sportsman J. Acree Devin indulged at his Wylliesburg home in 1935 has grown into a $25,000 a year game bird-hunting business with a $75,000 investment.

Becoming interested in preservation and protection of game, the Charlotte County hunter and sportsman was among the first to sow small areas on his farms to seed mixtures for birds during the winter when their food supply was critical. This interest grew on him until, in 1938, he bought 20 pairs of quail and started raising and releasing birds annually on his land for his own hunting and that of his friends. By 1945, he was raising 3,000 to 5,000 quail a year.

Because that was more than he could use, he sold some to others for restocking; but this outlet also proved to be too limited, and in 1950 Devin bought a 600-acre farm about 25 miles from his home in the northeast part of the county.

When he took possession of this farm—which came to Joseph Morton upon grant from King George of England in 1740—there were 200 acres of open or partially open land; but most of that was idle, with a high percentage of it grown up in small bushes. The farm was producing 1.7 acres of bright tobacco, a few acres of corn, and a small acreage of small grain; but Devin discontinued all cropping and cleared the idle fields of bushes and seeded them to cover and food for wildlife.

Enough seeding must be done each year to assure ample food for all the game. In this part of the business, Devin relies upon a plan the Soil Conservation Service helped him work out through the Southside Soil Conservation District. Each year he seeds 30 acres



Devin at his game farm entrance.

Devin with son J. A. Jr., and dog Duke.

The author is work unit conservationist, Soil Conservation Service, Charlotte Court House, Va.

to a mixture of milo, peas, beans, millet, and buckwheat, in plots ranging from one-half acre down. He keeps the rest of his open land in cover crops, perennial grasses, and legumes. There are four ponds —a 10-acre pond, a 6-acre pond, and two 1-acre ponds—that are used for the ducks and for some summer fishing by invited guests.

Immediately after buying the farm, Devin began building Hollow Log Hunting Lodge. The Lodge setup now includes a caretaker's house, a recreation room, lodging and dining quarters for guests, and a building for preparing, packaging, and freezing take-home game for the guests, the number of whom has grown to 350 a year from 175 the first year of commercial shooting in 1953. In addition, there are a dog kennel, a master holding pen for 10,000 quail at a time, 13 small holding and releasing pens, and individual pens for other game like chukars, ducks, pheasants, and turkeys.

Devin maintains his laying pens and incubators at Wylliesburg, where he keeps from 400 to 900 pairs of quail. The young birds are kept there until they are 8 weeks old and then moved to the master holding pen at the Lodge.

By special permit from the Commission of Game and Inland Fisheries, hunting begins October 1 and continues through March 31. The owner has to comply with such other regulations as having the entire area fenced, keeping the required number of birds on hand, and filing a report with the Commission every 30 days on the game killed.

Hunters come to Hollow Log Lodge from various professions, and from as far away as Chicago and Philadelphia. After expenses of $14,000, last season's gross intake of $25,000 left a net return of $11,000 from these hunters' indulgence of their sport.

Each year, approximately 18,000 quail, 2,000 pheasants and chukars, and a sufficient number of turkeys and ducks to meet the needs are released. Most of the time Devin has hatched enough birds for his needs, but in 1962 he had to purchase 6,000 quails from out of State. He plans to incubate fewer and buy more in the future.

Each hunter pays a fee of $45 a day, for meals, lodging, guide, dogs, and the privilege of shooting eight quail. Additional quails are $2 each, chukars $3, pheasants or ducks $4, and turkeys $12.50 apiece. The charges also cover dressing, packaging, and freezing game, if desired.

Liability insurance is carried on all guests, who must have had shooting experience and be accompanied into the field by a guide and not more than one more guest.

Devin's hunting business has grown until he has to employ a full-time caretaker and, seasonally, 2 maids, 2 cooks, 1 to 2 persons in the dressing and packaging room, and 4 to 6 guides. He also keeps 30 well-trained dogs.

Boat house and wild duck holding pen on one of several lakes on Hollow Log game farm.

Some of 10,000 bob white quail held in pens for stocking farm. Wild turkeys also are reared on the farm

◆

Careful planning before building a farm pond can help prevent the growth of annoying weeds, by avoiding large areas of shallow water.

Looking west down Chumstick Creek Valley over Merry's headquarters, in foreground, and part of his Cascade Mountains foothills ranch beyond.

Washington State Rancher Adds Recreation and Wildlife

By Gordon F. Stubbe

CLAYTON MERRY is revamping his 1,040-acre cattle ranch in Chumstick Canyon near Leavenworth in central Washington to include recreational and wildlife developments ranging from pheasant and fish production to horseback riding and overnight camping. Water management and conservation is the key to his new combination livestock - recreation operation.

It is being carried out by means of a farm conservation plan Merry is putting into effect through the Wenatchee-Entiat Soil and Water Conservation District with a cost-sharing agreement under the Cropland Conversion Program of the 1962 Food and Agriculture Act. The Soil Conservation Service is providing technical help in developing the plan, which includes converting alfalfa hayland to permanent pasture, recreation, and wildlife uses.

The Farmers Home Administration makes long-term loans to enable farmers and ranchers to install income-producing recreational facilities and also provides technical servicing of the loans. The Agricultural Stabilization and Conservation Service is responsible for administration of the Cropland Conversion Program and for leadership in its development.

Merry's pilot project also includes repairs to Chumstick Creek where it runs through his farm, and a series of reservoirs, dams, and check structures. Together, they will restore the water table to the fields below for wildlife habitat plantings, supply water storage for ranch use and for tanker-pumping operations in case of forest fires, and be a source for sport fishing.

"This is something I have wanted to do since April of 1956," Merry said, recalling a flood that year which tore out the creek bottom, left an unsightly gully, and dropped the water table of the land dangerously low.

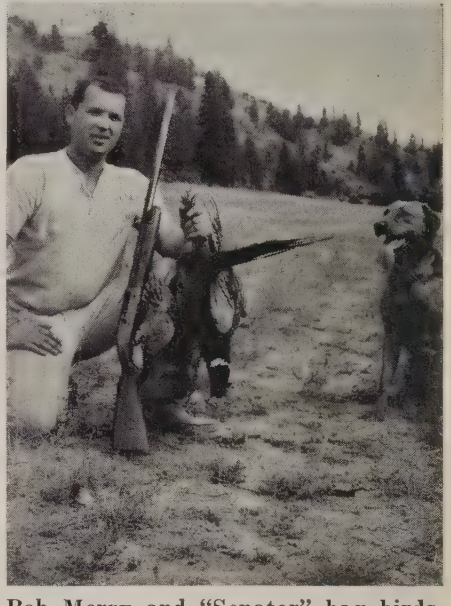
The conservation plan provides

The author is work unit conservationist, Soil Conservation Service, Wenatchee, Wash.

Merry and son Bob (l.) check on sign.

Two reservoirs which supply water—and fishing—for the Clayton Merry ranch.

1,400 pheasants are raised in these pens covering 30,000 square feet.



Bob Merry and "Senator" bag birds.

for a bypass and for two small dams that also will provide water for fishing ponds. A series of reservoirs, dams, and check structures also will be built on Chumstick Creek from the Wenatchee National Forest border down to Merry's west property line. Two ponds on Second Creek and one on Douglas Creek, already filling with water, will be used as reservoirs and fish ponds for public fishing for a fee.

Wildlife habitat plantings are part of Merry's program. Where hay once was baled, a State-licensed pheasant-shooting preserve is now operated. Used for pheasant cover, the alfalfa also returns more humus to the soil, and helps to prevent erosion.

Merry obtained a license from the Washington Fish and Game Department in 1962 to operate a shooting preserve on 200 acres of his ranch. His overall plan provides for additional bird-rearing pens, kennels for boarding hunting dogs, a clubhouse, altering the present barn for boarding and rental saddle horses, and for campsites and cabins for overnight camping. A new recreational activity for this area, mallard duck-flight shooting, also will be offered on the Merry ranch in the future.

Meanwhile, Merry is expanding his 11-year cattle operation to take full advantage of natural grazing in "grow-out" feeding of young calves to the 700-pound stage.

Farm Ponds in Smokies' Shadow Yield Trout for Fun and Profit

By Sellers G. Archer

TWENTY-FIVE farm pond owners in the Tuckaseigee Soil and Water Conservation District are turning a neat profit for themselves and providing welcome trout fishing for the overflow of visitors to the Great Smoky National Park in western North Carolina.

Work Unit Conservationist W. G. Davis of the Soil Conservation Service, which has helped in the planning and building of 100 ponds in the district, estimates that the net income to the 25 pond owners who offered trout fishing was about $30,000 in 1963. Swain County Agent R. L. Lyday finds that the harvest of trout, by both tourists and local fishermen, is growing into a volume business. To which District Board Chairman H. P. Browning adds this supporting observation:

"We have just scratched the surface in developing this new source of income for our farmers. The ponds, and other recreational features being developed, will mean a new and better way of living for many of our cooperators."

It all began as farm incomes dwindled and farmers looked for part-time jobs in town or for other sources of income. The flow of tourists grew, until camp grounds in the Bryson City area of the Great Smokies overflowed and trout fishermen too often found the streams overcrowded or fished out. Operator I. B. Jenkins of a country store near the entrance to Deep Creek Park listened to their questions and set out to do something about them.

After providing some rental units and riding horses, he consulted SCS biologists and set up his farm pond for trout fishing, at a cost of about $2,000. He grossed about $10,000 and had an estimated net profit from the fishing of around $3,000 in 1962; and his total tourist business netted about $4,300.

Dan Morris sought help in planning a similar venture. SCS engineers planned an underground pipeline through which water flows by gravity from Deep Creek into a pond he dug near his house. The ⅛-acre pond will carry 4,500 fish, summer and winter. He planned to build a larger pond this year, with a pump to increase the

Fishing on the Dan Morris farm in the shadow of the Smokies.

Morris (r.) looks on as Dr. Floyd Cunningham and son Jim (l.) size up young Tom Melton's nice string of fish.

The author is field information specialist, Soil Conservation Service, Spartanburg, S. C.

It's feeding time for young rainbows!

flow of cold creek water through both ponds.

Jenkins, Morris, and a third soil conservation district operator, Fred Lollis, hatch out about a quarter of a million fish each year for stocking their own and 22 other trout ponds in Swain County. Fertilized rainbow trout eggs cost about $5 per 1,000, and it costs 35 to 40 cents to produce a pound of fish from a feed-conversion standpoint. Producers get $10 to $50 per 1,000 fingerling trout, depending upon the size.

The farmer who wants only the "retail" part of the business can build an average small trout pond in this area for approximately $500. The rest of his investment is for the fingerling stock, feed, and management.

The customer pays from $1.45 to $1.65 a pound for the fish as they come from the ponds.

"But it is the cheapest trout I ever caught," as one fisherman puts it. "I pay nothing for a guide to take me to trout streams. I don't even have to buy a fishing license—and I never come home empty handed."

The State's bag and possession limits likewise do not apply to such commercial fish, which the pond operators tag with tabs supplied by the State Wildlife Commission; and the fishermen can use their own equipment or that supplied by the operators.

The season opens when warm weather comes and closes about Labor Day; but Jenkins reports customers come from factory towns and small cities in western North Carolina and upper South Carolina on almost any pretty day in the fall or spring.

"We give a great deal of attention to people who are no longer able to enjoy the more rigorous forms of fishing," Mrs. Morris says. "These people are the 'bread and butter' of our business. We like the good days when sales amount to $200 or more, and the big customers such as the two men who caught $55 worth of fish in 2 hours. But it is the customers who come back day after day who make this business dependable."

Do the established trout farmers fear the competition from other farmers who want to get into the fishing-for-a-fee business?

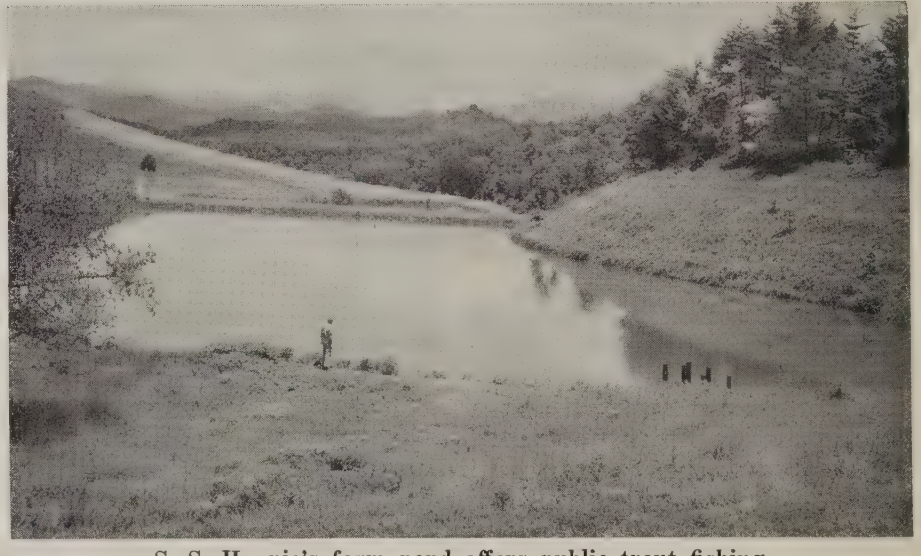
"It is more cooperation than competition," Dan Morris explains. "For one thing, many of them are customers and buy their young trout from us. For another, all of us together can't meet the demand during the busy holiday season. Together we are helping to build the reputation of this area as a trout-fishing center."

And, as Conservationist Davis says: "It takes good planning and management to establish and operate a trout hatching and rearing enterprise, and even a catch-out pond. The cost is fairly high, and the risk is great. Like livestock, fish require daily care throughout the year."

Most pond owners continue to work in the field or at outside jobs, and let other members of the family handle the fishing trade. But, as Jenkins points out, the Swain County trout farmers' reputation is growing among the more than 4 million people who may come this way to visit the Great Smoky Mountains National Park area each year. To keep abreast of the demand calls for considerably more than counting change and tagging the customers' fish. As Morris explains:

"To make the fishing attractive and profitable, large numbers of trout ranging from 10 to 20 inches in length must be concentrated in a small body of water. We feed the fish to keep them in good condition. We can maintain a satisfactory water temperature by diverting creek water through the pond. But the critical problem is to maintain the oxygen content."

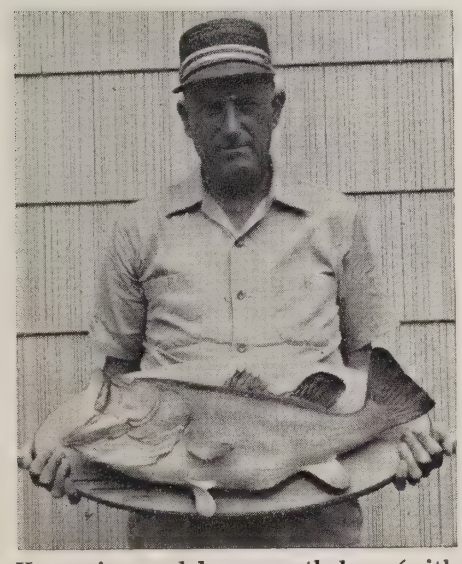
For this reason, Morris pipes water from a mountainside spring. The pressure built up by the fall from the spring catchment through the underground pipe causes the



S. S. Haynie's farm pond offers public trout fishing.

water to spray out into the pond; and the jet streams and the agitation of the water's surface add enough oxygen for the 4,500 fish in his pond, which have been held in rearing ponds until large enough to catch the next year.

The best part of this kind of trout-fishing business, as Jenkins says of his own operation, is that the pond where the customers fish will never be "fished out."



Kansas' record largemouth bass (with fisherman Glenn Barrett).

Kansas Watershed Lake Gives Up Record Bass

By Elbert L. Bell

KANSAS' record-size largemouth bass amply demonstrated the recreational wildlife values of multiple-purpose small-watershed project developments when he got himself hauled from the Aiken Creek pilot watershed lake in Chautauqua County last May 16.

The 10-pound, 1-ounce beauty was 24 inches long. (Doubters see photo above.—Ed.) It was pulled out of the sediment pool impoundment of Upper Bee Creek Dam No. 1, by Glenn Barrett, a Bartlesville, Okla., petroleum company employee who lives in Caney, Kans.

"I knew he was a whopper the instant he struck the plug," Barrett reported of his catch, which was registered with the Kansas Forestry, Fish and Game Commission and now hangs mounted on a paneled wall of the family room in the Barrett home. "I was really scared when I saw how big he was as I pulled him over the side of my boat."

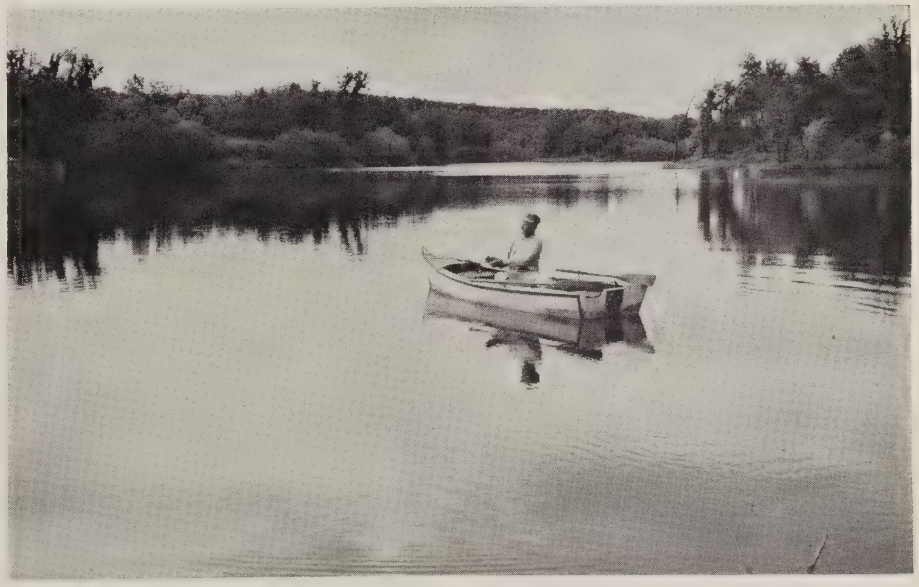
Barrett claims he could stick both of his doubled-up fists in the big bass' mouth.

The Aiken Creek project, in southeastern Kansas, is one of more than half a hundred pilot watershed projects which were forerunners of small-watershed projects now being developed throughout the country with local-State-Federal cooperation through authorization of the 1954 Watershed Protection and Flood Prevention Act (Public Law 566).

The Aiken Creek pilot watershed is in the Bee Creek Public Law 566 project authorized in 1962, in which contractors are now building additional floodwater-retarding structures for benefit of the Chautauqua-Montgomery county area. Five such structures are included all together, plus conservation treatment on the watershed's 45,300 acres of privately owned land.

Sponsored in 1953 by the Chautauqua County and Montgomery County soil conservation districts, the Aiken Creek pilot project was terminated as such in 1958. It included the Bee Creek dam and reservoir and watershed land treatment, together designed to handle problems of soil erosion and runoff on upland areas and floodwater and sediment damages on the flood plains.

The floodwater-retarding structure behind which Barrett caught his whopper was completed in



Another fisherman tries his luck in Bee Creek pilot watershed lake near spot where record catch was made.

The author is soil scientist, Soil Conservation Service, Sedan, Kans.

1954. It controls the water runoff from the whole pilot project area of 6,700 acres of privately owned land. By the project's official termination date, several landowners in the reach immediately below the project estimated they had benefited by more than $1,500 per farm in 1957 and 1958.

Although the emergency spillway has not yet operated, the 30-inch concrete pipe principal spillway has flowed many times; and the water has been released through the drawdown pipe in drought periods for use by farmers and contractors.

In the meantime, the 214-acre Aiken Creek lake attracts many fishermen and other recreation-minded people, especially from the Coffeyville and Independence areas to which it is most accessible. Facilities for fishermen and picnickers were put in by landowner Glen Aiken of Sedan. A Boy Scout council campsite is operated on a peninsula in the reservoir.

Under the amended Watershed Protection and Flood Prevention Act, recreation can be an authorized purpose of a project, and the Federal Government can bear up to half the cost of a reservoir or other developments included for fish and wildlife or recreation. Whether built primarily for such purposes or not—as in the case of the Aiken Creek reservoir—pools formed behind watershed dams are providing recreational uses including fishing, hunting, boating, picnicking and camping, skiing and other winter sports.

Of the 528 Public Law 566 watershed projects approved for operations in the entire country to January 1, this year, 218 were multiple-purpose projects. Of these, 48 included fish and wildlife benefits and 32 recreational benefits. An increasing proportion of proposed projects include such multiple purposes.

Pay-As-You-Shoot Hunters Pay Off for New York Farmer

By F. E. Mulvaney

NEW YORK Farmer Don Steger got into his now thriving pay-as-you-shoot business because "I just hated to look at the tail end of a cow any more."

"It wasn't always this way," he recalls of the beginnings of the 1,100-acre Cold Brook Game Farm sporting preserve he owns and operates in Cortland County. "In fact it was pretty hard sledding to get the thing under motion. The 100,000 feet of timber we cut in 1952, when we started, helped to keep us floating until we could attract enough customers for our game product. In those days, there wasn't the acceptance by the hunting public that there is now. There was less hunting pressure on farmland and State-owned land.

"Hunters, brought up on the heritage of 'free hunting,' were unwilling to pay a fee for the privilege of hunting under controlled conditions. There has been a constant fight to change this attitude.

"I well remember that first year. We started with 1,200 pheasants on September 1, and by March 1, the end of the season, we had 300 left. This wasn't bad for the first season's try. We did lose money, but we knew we could do better than that. Now we hatch and rear 4,000 birds a season."

An invitation to shooting.

Steger has some 120 acres of cropland, 160 acres of wildlife area, and 700 acres of hardwoods and conifer plantations. Since 1952, the year he also became a cooperator with the Cortland County Soil Conservation District, he has installed 64 acres of strip cropping, 6,875 feet of diversions, 1 pond for mallard ducks, 1 pond for fish, 18 food patches for wildlife, 3 miles of hedgerow planting, 15 acres of cover planting, and many acres of woodland improvements as part of his complete soil and water conservation plan.

He tells how these practices, applied with Soil Conservation Service technical help, have all paid off:

"Game birds like cover, the edges. Stripcropping adds to the edge, and furnishes 10 times more hunting than if that 90-acre field

The author is work unit conservationist, Soil Conservation Service, Cortland, N. Y.

A place to "swap lies."

The main game—4,000 pheasants.

there was one continuous piece of ground.

"And the contour hedges—more cover. I like multiflora rose the best, because of the dense cover it offers, and the overwhelming berries. While the berries are a pheasant's second-choice food, deer often browse on these in the winter. The hedge causes trouble by plugging up with snow, but we plant Scotch pine and spruce to take up the slack in that respect. This makes for 'wild bird' hunting, not the 'tame bird' put-and-take hunting I have witnessed on some preserves. We also have autumn olive, honeysuckle, and dogwood and Natob lespedeza, for hedges.

"I've decided that a mixture of sorghum, millet, and buckwheat is the best for our purposes for food patches. We make these patches small, not over one-fourth acre, and provide escape cover close by.

"Those diversions provide an extra bonus we never thought of at the time they were built. You see, when we mow the hay on them, we hold the cutter bar high. This provides additional low cover for the birds. They like it there. It's common practice to flush three or four birds from each diversion when we have dogs running."

Ducks also are on the hunters' bill-of-fare at the Cold Brook Preserve. Steger raises 700 to 800 mallards a year, or just about enough to satisfy the present public demand. He tried quail 2 years ago, but found the rugged climate was too much for these little birds.

Steger has learned much from experience about his customers and problems:

"The average customer wants a relaxing atmosphere," he observes. "He doesn't want to be rushed through a shoot. He wants to pick his own time of arrival and departure. This creates a problem of party scheduling, so that all parties are at a safe shooting distance, one from another.

"He also likes to have a place to rest his weary bones after a shoot. That's why I built this cabin. It's roomy. There's plenty of space before that open fireplace, where he can sit with his friends and 'swap lies.' Then a customer always wants to use his own dog, if he has one, and considerable tact may be needed to switch dogs when the owner's 'pride and joy' has an off day."

Once in a while, Steger says, a customer complains about the prices—$5 for each pheasant that is shot, plus $5 a day for the hunting privilege. But he figures that "when you consider we hatch only 70 percent of the pheasant eggs, and raise 90 percent of the resulting hatch, at a total cost of $2.15 a bird, I think our charges are in line with competing sports."

"The future of this kind of business is on the move," he will tell you after a dozen years in it. "We will have need for more shooting preserves, as pressure for hunting room increases. I could expand here, but I like to keep it to a one-man operation, with a relaxed atmosphere for repeating clientele. Anyone who's interested in going into it needs a liking for this life, a strong back, will power, an ability to get along with people—and no illusions. It's not a get-rich-quick deal."

Steger finds that contour strips and multiflora rose hedge provide game food and edges for shelter.

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THE DARK TRAVELER. By Josephine W. Johnson. 190 pp. 1963. Simon and Schuster, New York. $3.95.

Many of us have argued that soil conservation and soil conservationists could and should be subject matter for novels. But except for one or two biographical treatments, this is the first novel—so far as we know—that uses a soil conservationist and his job as a normal part of a story which does not, in itself, have a conservation education mission.

The author (in private life the wife of Grant Cannon, editor of *The Farm Quarterly* in Cincinnati) is a writer of note. Her 1934 book, "Now in November," was a Pulitzer Prize winner. "The Dark Traveler," coming along in 1963 after many other published items, is a skillfully and beautifully written story of a young man with a great mental torment arising from his mother's death and harsh, unfeeling treatment at the hands of a coarse, impatient father.

An uncle, kindly and wise, tries to salvage what he knows to be a brilliant if abnormal mentality by bringing the young man into his own home. The novel thereupon unfolds, exploring the therapeutic effect of a loving family and of contact (through the influence of the conservationist uncle) with the verities of Nature.

Miss Johnson chose soil conservation as the occupational background for the uncle, believing that it would provide a characterization of a man who understands and works with people, animals, and the land.

In addition to drawing upon the extensive agricultural background of her husband, Miss Johnson visited Soil Conservation Service offices, studied conservation farm plans and soil maps, and watched conservationists at work. She gained, for example, an understanding of the concept as well as the terminology of land capability and uses it plausibly, but not laboriously or technically. Worth special note is her description, through the eyes of the disturbed youth, of trees, flowers, birds, and insects in the woods where he walks with his camera.

—D. Harper Simms

TRENDS IN NATURAL RESOURCES COMMODITIES. By Neal Potter and Francis T. Christy, Jr. 568 pp. 1962. Resources for the Future, Inc., Johns Hopkins Press. Baltimore. $17.50.

This 5-pound tome is designed primarily as a reference book for resource students. Its more than 300 tables and 200 charts and graphs bring together for the first time statistical data on natural resource materials produced or consumed between 1870 and 1957. It was the period during which the United States was transformed from an undeveloped to a highly industrialized country.

The book does not deal directly with natural resources such as land, water, and mineral reserves but, instead, measures their product. The authors admit that natural resources are more basic than their product, but say economic data on the products are more enlightening and tractable than those on resources as such.

Study leading to analysis and interpretation of the United States' economic growth certainly can be aided by use of this book. The data, on almost 100 commodities, are presented so that statistics of any given year may be compared with those of any other year. While still in manuscript form, the work was used to supply the statistical foundation for the soon to be published "Economics of Natural Resource Scarcity," by Harold J. Barnett and Chandler Morse, and a forthcoming appraisal of natural resource problems and prospects in the United States between now and the year 2000.

—Joe Larson

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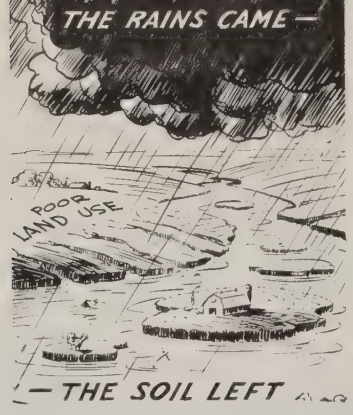

Soil Conservation
25 Years Ago

"If a road ditch can be used for a terrace outlet channel, it is often less expensive, at least no more expensive, to repair and treat the road ditch for this purpose than it is to excavate and treat a parallel outlet on the land adjacent to the highway. When the road ditch is used and properly treated, the highway is benefited as well as the farm run-off disposal system. Cooperative efforts of this type eliminate duplication and provide a more stable outlet system.

"In the semiarid section of the United States, the water collected by road ditches can often be utilized to advantage by the adjacent landowner. Properly constructed intercepting terraces that tie into the road embankment will divert the surplus water to the adjacent land. This practice not only will help to prevent erosion on highway rights-of-way, but will improve the moisture conditions of the adjoining pastures or cultivated fields. This additional moisture often assures a profitable crop return where there would otherwise be a failure."

COVER PICTURE—Spring floods like this on the Red River of the North near Grand Forks, N. Dak., in April 1950 still come too often on too many of the country's creeks and rivers every year—but watershed protection and flood prevention and farm-by-farm soil and water conservation are cutting down their frequency and severity. The protruding snow-covered ridge at the right is the only "dry land," and the ripples leading off the top of the picture mark a road underneath. — Photo by Hermann Postlethwaite.

VOL. XXIX, NO. 9 APRIL 1964

CONTENTS

Page

195 Floods Are Being Prevented Watershed by Watershed
By Gladwin Young

197 Buffalo Creek First of 11 Early Projects Done
By Irving B. Stafford and Adelbert D. Ward

199 Research for Stabilizing Stream Channels
By Robert P. Apmann

201 Flood-Proofing Pays Off for Indiana Farmers and Towns
By Kent Alverson

203 Yazoo-Little Tallahatchie Is a Paying Project
By W. L. Heard

205 Kansas Watershed Projects Joined in Benefits
By Leslie E. Johnson

206 Arkansas Watershed Team Speeds Flood Prevention and Recreation
By Hollis R. Williams

209 Little Sioux Flood Prevention Helps Landowners
By Harvey R. Lindberg

211 Washington Farmers Solving Problem of Too Much Water
By Everett Loreen and Herb Boddy

213 Snow Surveys Help West in Floods or Drought
By R. A. Work and William G. Shannon

215 Colorado Small-Watershed Dams Stop Floods
By Dearl B. Beach

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FRANK B. HARPER, Editor

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Floods Are Being Prevented Watershed by Watershed

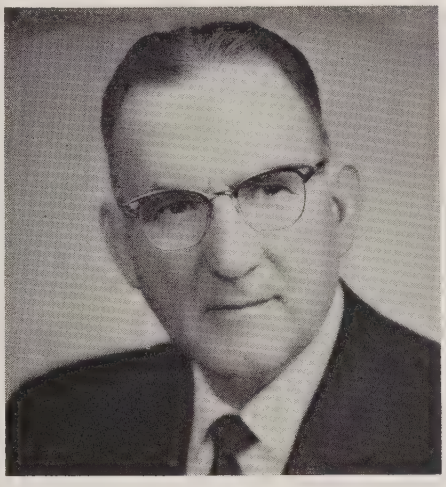
By Gladwin Young

DROUGHT and floods have been two of man's greatest enemies throughout recorded history. That is because their infrequency and unpredictability have tempted him to occupy flood plains when they are dry and to plow up semiarid areas in years of above average rainfall.

Too much water or too little water likewise are problems with which farmers and communities, large and small, in America have been confronted since settlement days. Today, we are seeing rapidly expanding efforts to cope with these weather-born problems through soil, water, and plant conservation systems applied on farms and ranches and in small watersheds and river basins. These increasingly effective programs, including local soil and water conservation district operations, reflect maturing public awareness of the unconscionable cost of unchallenged floods, in particular. And they bespeak, also, unprecedented support of preventive programs at every level of Government—local, State, and Federal.

"Flood control," as a function of the Federal Government, dates back to the first Congressional authorization in the Act of September 30, 1850, which authorized the control of inundation of the Mississippi River. The work was carried on by the Corps of Army Engineers, which dates its origins to 1775 but was given the "Corps" name in 1779 after creation of the Engineering Department of the Army the year before. Earlier, however, the Federal Government engaged in harbor dredging for navigation improvement, as in Mobile Harbor as early as 1826 and in Baltimore Harbor in 1836.

For the next 100 years, the emphasis was on downstream flood



Gladwin Young.

control on the mainstem rivers, though early in the present century Congress provided for the Federal Government to supplement and cooperate in private water resource developments. The Reclamation Act of 1902, for example, authorized water development for arid and semiarid land in the Western States. Additional authorizations were made for protection of water-producing watersheds, through the renamed Forest Service transferred in 1905 from the Department of the Interior to the Department of Agriculture; and in 1911 the Weeks law established a new national policy for Federal purchase of forest lands necessary to the protection of the flow of navigable streams.

The concept of flood prevention —then still called "flood control" — on upper watershed lands and tributary streams was born in the 1930's. Thus Public 46 of the 74th Congress in 1935, establishing the Soil Conservation Service in the Department of Agriculture, declared Congress' policy, among other things, "to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources, control floods, prevent impairment of reservoirs, and maintain the navigability of rivers and harbors." And the 1936 Flood Control Act authorized the Secretary of Agriculture to make preliminary examinations and surveys of watersheds and to carry out works of improvement for runoff and waterflow retardation and prevention of soil erosion.

Through the operation of both these acts, as well as under subsequent authorizing legislation, the Department of Agriculture has emphasized creek-size watershed conservation land-treatment practices and structural measures to slow down water runoff before it reaches the flood plains. This new approach, as has been borne out in practice, complements the mainstem flood control which has continued to be the responsibility of the Corps of Engineers under the 1936 and later acts. Together, they will give maximum protection from flooding and conservation of our water resources from the farthest tributary headwaters to the mouths of our major rivers.

Further to speed up attainment of this objective, the Department of Agriculture since the 1936 Act authorization also has participated in surveys for planning and devel-

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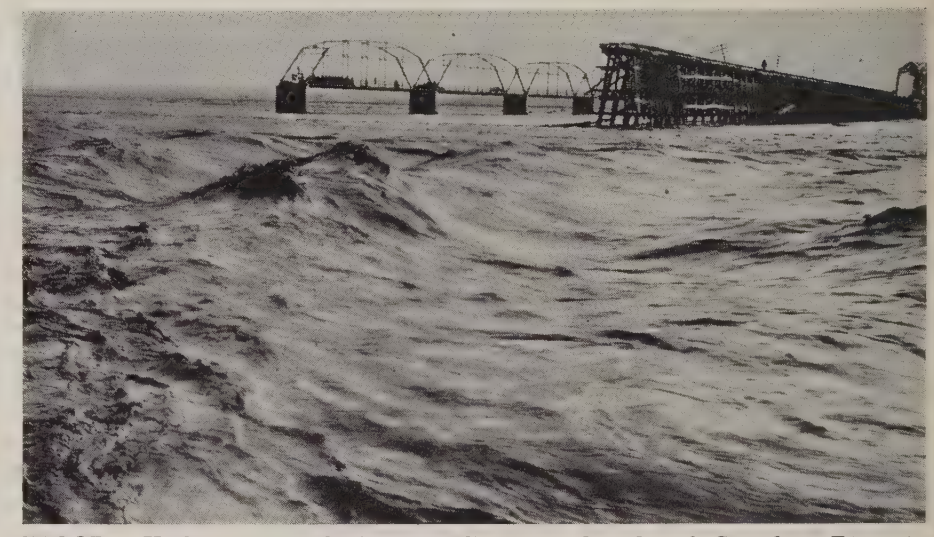
oping the water resources of selected river basins. This planning had it roots in flood control surveys carried out by the Corps of Engineers under 1928 authorization. Working through its Soil Conservation Service, the Forest Service, and the Economic Research Service, the Department cooperates principally with the Corps, the Bureau of Reclamation, the Fish and Wildlife Service, and the Department of Health, Education, and Welfare, and with States and local agencies concerned.

The watershed-flood prevention approach was extended through authority of the 1944 Flood Control Act to work in subwatersheds of 11 major river watersheds: Buffalo Creek in New York; middle Colorado River, Texas; Coosa River, Georgia and Tennessee; Little Sioux, Iowa and Minnesota; Little Tallahatchie and Yazoo, Mississippi; Los Angeles and Santa Ynez, California; Potomac, Pennsylvania, Maryland, Virginia, and West Virginia; Trinity, Texas; and the Washita in Oklahoma and Texas. Because of World War II, work was not started on them until 1946.

By the 1950's erosion control and flood prevention programs had operated long enough for landowners and entire communities to see the effectiveness of soil and water conservation practices on the runoff of surface water and the flow of streams. It was out of these combined experiences of lay people and of professional people in the Department of Agriculture that the specific proposal came to extend the soil and water conservation program in small watersheds, with Federal technical and cost-sharing assistance.

Congress in 1953 appropriated funds to start such work on 62 "pilot" watersheds, 54 of which actually were put into operation through local community-State-Federal cooperation; and in 1954 it enacted the broad Watershed Protection and Flood Prevention



FLOOD.—High water washed away fill on north side of Canadian River in Texas, necessitating the building of 3 more bridge spans.

DROUGHT.—Washita River in Oklahoma stopped flowing here for first time in history in the fall of 1956.

REMEDY.—This Tennessee water-slowing dam is one of many which, with conservation land treatment, are helping prevent flooded and dry streams in small watersheds.

Act (Public Law 566). The original small-watershed act was oriented specifically toward flood prevention, and included cost-sharing for nonstorage irrigation systems and for drainage. It was amended in 1956 to include cost-sharing on irrigation storage, and credit assistance for such nonagricultural water-management purposes as municipal and industrial water supply, recreation, and fish and wildlife management.

A 1958 amendment made fish and wildlife measures eligible for cost-sharing; and in 1962 the Act was further amended to include recreation developments in cost-sharing. There have been indications pointing to the likelihood of future amendments that will further enlarge the purposes of the Watershed Protection and Flood Prevention Act.

Meanwhile, the strides we have made in flood prevention and watershed protection in less than 20 years, actually, speak for themselves. Here is the score:

11 authorized flood prevention projects—1 completed as of December 31, 1963 (see p. 197); and structural and land treatment work finished or under way as of June 30, 1963, in 225 subwatersheds on 18½ million acres, or about 60 percent of the authorized work area.

Pilot small-watershed projects (as of June 30, 1963)—45 of the 54 active projects completed, and 3 each scheduled for completion in 1964, 1965, and 1966.

Public 566 watershed projects (as of March 1, 1964)—532 authorized for operations and cost-sharing, of which 60 had been completed; 963 authorized for Federal planning assistance; and 2,076 all together for which sponsoring local organizations had applied for Federal help.

Structural measures installed in the 3 project categories together to last June 30 had included 2,578 floodwater-retarding dams, 7,901 grade stabilization structures, 43 miles of stream channel stabilization and 1,429 miles of channel improvement, and 557,393 acres of critical area planting of grass or legumes, trees or shrubs around or on earth structures.

In addition, watershed landowners had installed—besides planting, cropping, tillage, and other practices applied through their farm or ranch conservation plans developed as soil and water conservation district cooperators—these measures: 10,144 miles of diversions, 127,481 ponds, 117,071 miles of terracing, 146,840 acres of waterways, and 13,375 structures for water control.

River basin surveys—The Soil Conservation Service is taking part in surveys of 29 major river basins in 37 States.

Buffalo Creek First of 11 Early Flood Prevention Projects Done

By Irving B. Stafford and Adelbert D. Ward

THE Buffalo Creek flood prevention project in extreme western New York State made watershed protection history when it was officially terminated on December 31, 1963.

This was the first of 11 such projects authorized by the 1944 Flood Control Act in major river watersheds over the United States to complete all of the structural measures planned. Conservation practices are continuing to be applied on the upland by approximately 1,160 landowners in the watershed who are cooperators with the Erie and Wyoming County soil conservation districts and control about 40 percent of the approximately 253,000 acres outside the City of Buffalo. The application of these measures has been in progress since 1946, the year that flood control work, which had been suspended during World War II, was resumed; and stream channel improvement operations and structural measures were started in the fall of 1949. The operations in Buffalo Creek, as in the 10 other watersheds, have been carried on with Soil Conservation Service technical and financing help, in cooperation with soil conservation districts, other local and State organizations, and the U.S. Forest Service.

Actual monetary benefits obtained from alleviating sediment damage to industrial water, infertile deposition, swamping, and transportation are not yet available; but information recently released by the Agricultural Research Service at East Aurora indicates that a 3 percent reduction in sediment discharge into Buffalo harbor has resulted in a reduction in dredging of 24 percent, at an annual savings of $56,000, including maintenance costs.

The Buffalo Creek watershed, which lies in the central part of

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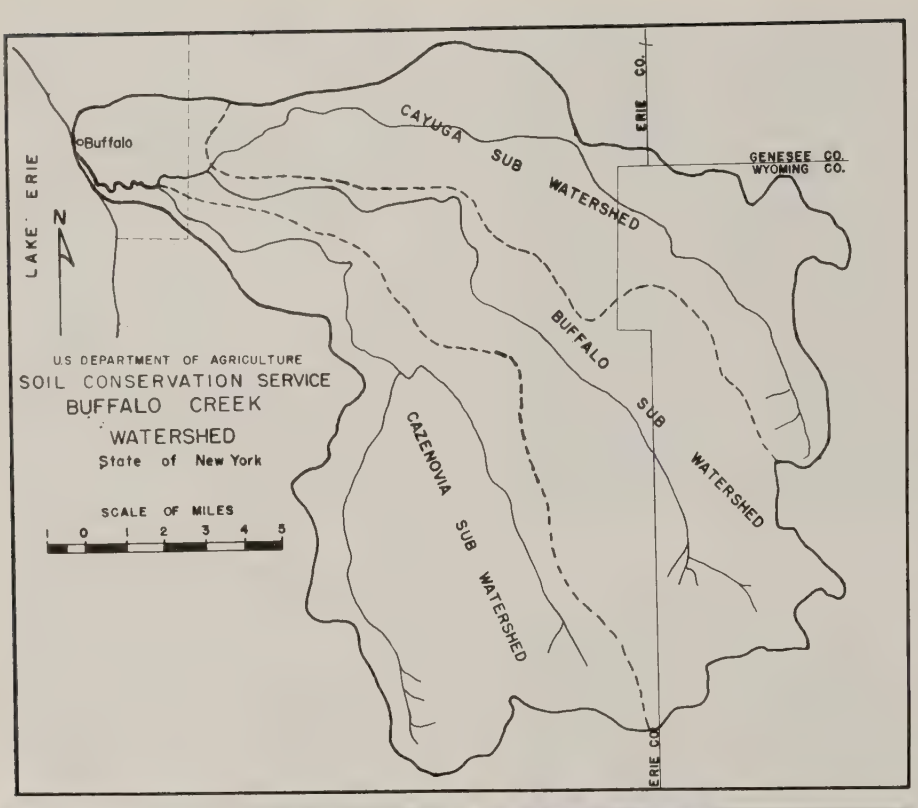
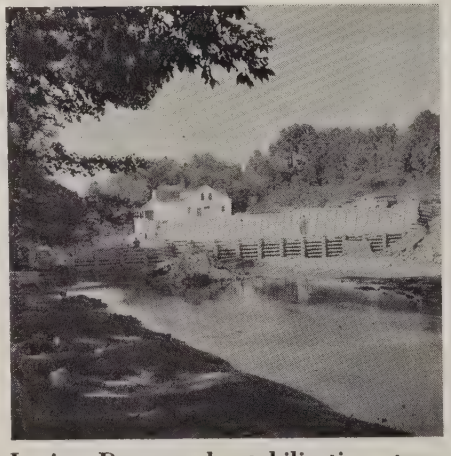


Streambank protection work in progress on Cazenovia Creek.



Legion Dam grade stabilization structure nearly completed.

Erie County and in the northwestern corner of Wyoming County, is drained by three subwatersheds: Buffalo Creek containing 172 square miles, Cayuga Creek containing 125 square miles, and Cazenovia Creek containing 140 square miles.

Buffalo Creek was selected as a flood prevention project on the basis of results of a detailed survey of the flood- and silt-source areas of the watershed made by the U. S. Department of Agriculture in 1938 under the authorization of the 1936 Flood Control Act; and a program was recommended including: Treatment of farmland to reduce runoff and erosion; treatment of submarginal land recommended for public purchase; and stabilization of streambanks to prevent their erosion.

A revised report in 1955 indicated average annual damages in the watershed on a long-term price base totaling $346,017, made up of: $241,607 from sediment; $67,263 from erosion, and $37,147 from inundation. Sediment thus was shown to account for about 70 percent of the damage—sedimentation of Buffalo harbor, damage to highways and railroads, cost of removing sediment from industrial water, and land damage through infertile deposition and swamping.

Detailed surveys of the watershed showed sheet erosion and streambank erosion were the two major sources of sediment in Buffalo harbor. It was estimated that 25 percent of all the sheet erosion material deposited in the three major subwatershed streams reached the harbor. After field surveys were analyzed, and allowances made for areas where streambank protective measures would not be justified, it was estimated the overall reduction in sediment damage from streambank erosion would be 53 percent.

The study showed that 47 percent of the damaging sediment in Buffalo harbor originated from sheet erosion and 53 percent from streambank erosion. Sediment damages were based on figures obtained from the U.S. Army Corps of Engineers, charged with the responsibility of maintenance dredging of the harbor, and from highway officials, railroad companies, and industries in Buffalo using raw water from the harbor, and on an analysis of data on sediment damage to bottom land. They included damages to the harbor of $129,485; to industrial water, $2,500; from infertile deposition, $11,076; from swamping, $5,226; and to transportation $93,320—for a total of $241,607.

The average annual benefit of the flood prevention program, based on that summary of sediment damage in the watershed, was calculated at $107,351. This total included reductions in damage and annual benefits of: Harbor—45 percent and $58,268; industrial water—46 percent, $1,150; infertile deposition—58 percent, $6,424; swamping — 80 percent, $4,181; and transportation — 40 percent

and $37,328.

Reduction of sediment damage in the watershed was only one aim of the project, and reduction of dredging costs was only one part of sediment damage. Annual benefits to the harbor alone are more than half of the original estimated benefits for all types of sediment damage in the watershed.

ARS figures show that from 1944-53 an average of 185,141 cubic yards was dredged annually from Buffalo harbor and 76,252 cubic yards from its entrance. By 1957, approximately 75 percent of the streambank stabilization work had been completed in the watershed. In the 6-year period since then, slightly more than 140,000 cubic yards has been dredged annually from the harbor—a reduction of 24 percent.

The major conservation measures applied on the streambanks by the SCS since 1949 include: Streambank protection, stream channel improvement, clearing and snagging, stream channel stabilization, dikes and levees, grade stabilization structures and structures for water control, and critical area planting.

Land treatment practices include such structural devices as diversions, drainage ditches and tile, farm ponds, grassed waterways, and spoilbank spreading; and such planting and other vegetative practices as tree planting, pasture and hayland planting and wildlife area improvement, and stripcropping.

Easements and rights-of-way for the installation of structural measures along the streambanks were provided by the Joint Board of the Erie and Wyoming County soil conservation districts, which also have the responsibility of maintaining the streambank protective measures. Annual maintenance costs are shared cooperatively by Erie ($3,500) and Wyoming ($1,500) counties, and by the New York State Conservation Department with matching funds up to $2,500.

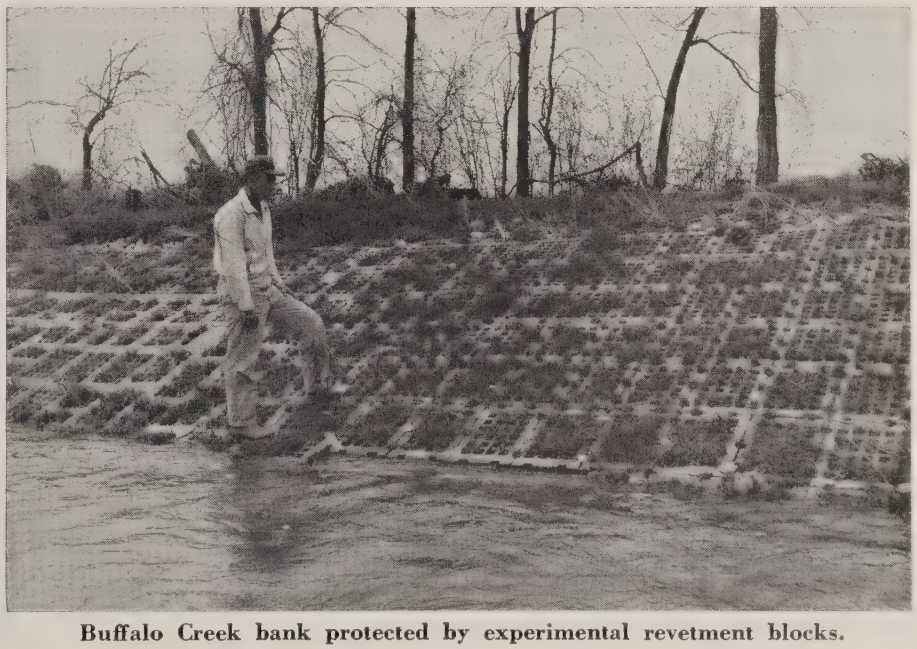
Research Seeks Best Techniques For Stabilizing Stream Channels

By Robert P. Apmann

TECHNIQUES for more effective and economical stabilization of streambanks in watershed protection and flood prevention projects over the whole country are being studied by the Soil and Water Conservation Division of the Agricultural Research Service on Buffalo Creek in New York and the Pequest River in New Jersey.

These two streams were selected for this research because their own channel improvement projects provide ready-made opportunity to study stream behavior and stability. Buffalo Creek, where the research was begun in 1952, is one of the 11 major watersheds for which flood prevention operations were authorized by the Flood Control Act of 1944. The planned streambank stabilization, complemented with conservation treatment of watershed lands, was completed in 1963.

The research was extended to the Pequest River in 1958. It was one of the more than half a hundred pilot small-watershed projects that went into operation the year before enactment of the 1954 Watershed Protection and Flood Prevention Act (Public Law 566), authorizing Federal technical and financial help for State-approved local projects. Federal technical and financing assistance for all flood-prevention projects is provided through the Soil Conserva-



Buffalo Creek bank protected by experimental revetment blocks.

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Test reach on Pequest River in New Jersey.

tion Service in cooperation with other U. S. Department of Agriculture agencies.

Specifically, the research studies are directed toward developing good engineering information for use in designing and constructing stream channel stabilization works. Such information can provide more accurate cost data on stabilized channels. Therefore, the research results are highly important to the designer, for the costs of adequate bank stabilization works are dependent on his judgment.

For a rational design of stabilization works, the designer must consider both the potential ability of the stream to erode its banks and the ability of the banks to resist the attack of the stream. An analysis must be carried out for all parts of the floodway in which stabilization is to be assured.

The erosive potential of a stream depends upon the forces which it exerts on the banks and the bed. Since the most important forces are the pressure and the drag of the water against its boundary (boundary shear stress), it is necessary to determine the intensities of these forces at all points of the stream channel. The resistive ability of the bank protection works depends, among other things, upon the size of the revetment material, where on the streambank the material is placed, and upon the method of construction.

The general procedure for the studies is to make intensive field measurements of selected floods to gain information on such important qualities of stream behavior as mean water speeds, mean boundary shear stresses, mean retardance coefficients, and the dissipation of energy by the stream. This information is then matched to the properties of the areas where incipient or minor bank damage has occurred during the flood flows. This matching gives the resistive abilities of the banks in terms of the important qualities of flow behavior.

Laboratory studies are used to provide additional information.

No. 74

This is the seventy-fourth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

On Buffalo Creek, the fieldwork is done on a 5-mile-long reach that includes a variety of such conditions as bed material, bed slopes, and stream channel bends. Some banks are reveted but others are not. Thus, it is possible to study the resistive abilities of both natural and protected banks.

Measurements in the reach depend on the passage of floodwaters of about bankfull stage. Streamgaging procedures are used to determine the peak discharge of the flow, and high-water marks are placed and surveyed after the flow passes. A complete topographic map of the stream channel was made from the 500 cross sections which were surveyed in the reach. These cross sections are rerun whenever significant changes occur in the channel shape.

Certain mechanical properties of the bank material are measured, such as riprap stone size and density, and cohesiveness of the soil. These different measurements are generalized somewhat by the use of dimensionless parameters and then applied to other similar stream situations.

Three study reaches were selected on the Pequest River, each being 1,000 feet long and having a different degree of bank stability. In contrast to Buffalo Creek, the bed slopes are less, and the bank material is smaller. Soil samples taken from the three reaches have been analyzed in a special laboratory flume at the National Sedimentation Laboratory at Oxford, Miss., for their ability to resist the erosive force of flowing water.

The resistive abilities of the banks cannot be measured entirely by the qualities of stream behavior, because bank failures may be accelerated by weaknesses arising from other causes. Some of these are: Ground water flow out of the banks, inadequate protection to the revetment toe, flow over the revetment top, attack of ice and debris, and inadequate or improper use of

vegetation. Analysis of these weaknesses and the development of procedures to counteract them are important parts of the research.

The primary procedure here is the observation of major damage to the banks. Any major damage from floods is carefully documented, and the causes of the damage are sought and related to the particular procedures that were used to build the banks. Recommendations for improved designs and procedures result from such observation. To aid in this study, a complete, illustrated history is kept of each reveted bank.

Suspended sediment samples taken for 10 years at three locations in the Buffalo Creek watershed as a collateral part of the research have shown the usefulness of revetment works for reducing sediment yield, by a decrease of about 40 percent. Almost all of this reduction resulted from the construction of revetment work by the SCS. Only about 40 percent of the total stream was reveted; but since the revetment was mostly placed in channel bends, this work effectively controls most of the streambank erosion.

Flood-Proofing Pays Off for Indiana Farmers and Their Towns

By Kent Alverson

FLOOD-PROOFING of the 8-mile-long and 4-mile-wide Elk Creek watershed in southeastern Indiana's Washington County is paying off for the area's half a hundred farmers and for the nearby towns where they market their truck crops and livestock.

This was the first project in the State to be completed with Federal help to local people through the Watershed Protection and Flood Prevention Act. It is one of a dozen Public Law 566 projects approved for operations in Indiana by January 1 this year, out of 24 authorized for planning among 69 project applications. Fields in Elk Creek valley were being flooded 3 to 7 times a year. One year there were 7 floods by August 1.

In the words of farmer Harry Jackson who, with his neighbors, had fought a lifetime battle with ruinous floods and marshaled all the resources available to put an end to them: "The operation was successful. We're thankful for this and glad it's all over."

Close to 35 acres of the Jackson farm had been devoted to defense purposes only—kept in trees and bayous to prevent scouring. As recently as 1960, a fast-developing flood took most of his crops and almost got his cows, too. Afterward, he had to "work out" to keep the family going. "I can farm the bottoms harder now and keep erosive hill land in pasture the way it should be," he said, "and I'm going to try some new truck crops now that farming is less risky."

Jackson's feelings are typical of those now prevailing throughout the Elk Creek watershed area.

The Elk Creek project had its beginning in 1952, at the instance of affected valley farmers like Junior Spaulding and Paul Garriott, Jr. An elected 11-men steering committee resulted from a farmers' meeting held in March 1933 in the Little York schoolhouse, at which Don Hinckle of the Salem Soil Conservation Service office explained the watershed approach to their problems.

The committee petitioned the Washington County Soil Conservation District for the SCS to check the feasibility of a watershed project; and immediately after the national Watershed Protection and Flood Prevention Act

SCS Administrator D. A. Williams speaking at 1963 dedication of watershed.

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was approved in 1954, Elk Creek landowners applied for the Federal technical and financing help it offered to responsible local community organizations that could qualify. It was one of Indiana's first two such applications.

The people pool efforts to get jobs done. For the local share of watershed project costs, for example, they raised all the money by voluntary contributions. All land, easements, and rights-of-way were donated.

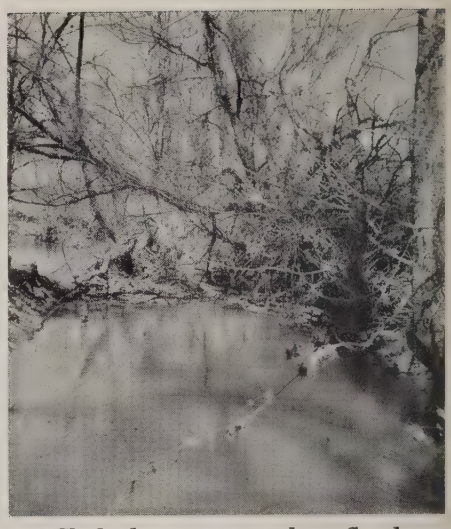
The Elk Creek Conservancy District was formed to raise the money to carry out the project, with Joseph Scifres, chairman; Paul Garriott, Jr., vice-chairman; and Hager Garriott, assistant soil and water conservation district supervisor, as secretary-treasurer. A selective cutting program followed by Hager and Orville Garriott on their approximately 1,200 acres of timbered upland helps to keep the watershed hills free from erosion.

Elk Creek rises in steep lands, locally known as "The Knobs," and is joined by five tributaries before it reaches a constructed canal that leads to the Muscatatuck River. Waters of the creek and its tributaries gain considerable velocity and have cut a complex drainage pattern into the relatively flat lowlands to the northeast. The flood plain is 1¼ miles wide at the confluence of Elk Creek and the canal.

Conservation measures, planned with SCS help to match the problems, include contour farming, tree planting, terrace construction, pasture establishment and improvement, pond construction, improved surface and tile drainage, and wildlife habitat improvement, along with seven major floodwater-retarding structures and 10 miles of downstream channel improvement. Landowners have applied more than 90 percent of the on-farm practices, and the last major structure was completed in 1963.

Water control, both in storage and removal, is the key to success in the Elk Creek watershed. The earth dams, built at strategic locations, provide both temporary and permanent water storage. Several landowners paid up to $5,000 apiece as their share of the cost for building additional irrigation water storage into each of three structures. Total cost to the Federal Government for flood prevention was $620,000. The local cost was about $240,000.

Because the Indiana Department of Conservation's Division of Fish and Game became interested in developing one of the structure sites for fish and wildlife, two of the planned structures were combined into one larger one, and the State bought 320 acres for development of a lake and wildlife habitat. The lake has 47 acres of water surface. It can be drained when necessary to restore the fish population balance. Parking and boat ramp facilities are being constructed, and the area will be open to public fishing and hunting.



Choked streams used to flood adjacent fields.

All together, seven new bodies of water have been created, ranging in size down to 3 acres. The other six structures are owned by farmers.

Most striking developments so far from water control are the changes in the land-use pattern and the diversion of corn and soybean acreages to vegetable crops. Livestock numbers are about the same, but pasturing now is mostly in the uplands on improved pasture. Shifting to truck crops on the best land is being encouraged by a large, independent cannery with plants at nearby Scottsburg and Austin. There is about 3,500 acres in the watershed that eventually could go to truck crops.

Hager Garriott irrigates two crops of green beans a year from a 12-acre pool behind the dam on his land, getting 4 to 6 tons an acre. His sweet corn averages 4

This flood detention reservoir also is used for irrigation and recreation.

tons an acre and cabbage about 20 tons. He and his brother, Orville, pay out $1,000 a year, mainly to high school boys, to cut and load cabbage.

The trend to truck crops is growing, and the canning factory at Austin is increasing its capacity and taking more kinds of vegetables. Last year, it contracted 100 acres of beets and 70 acres of sweet potatoes.

Hager Garriott pointed out that while there is more gamble in truck cropping because of weather hazards, insects, labor costs, and so on, elimination of flooding and drought hazards by watershed structures has made it profitable. He now grows only 25 acres of field corn, and this to feed to 30 head of steers.

Paul Garriott will tell you how successful the Elk Creek project has been in controlling flooding. As recently as January 1960, when the watershed installations were only 20 percent completed, floodwaters rose 2 inches on his front porch steps. With all the structures in, the floodway channel ran only two-thirds full after a 3.6-inch rain in March 1963 on frozen ground; and Garriott said that "without the project we would have had floods in March, May, and July, I am sure."

There are now close to 10 miles of blacktopped roads in his township. Because of past experience with floodwaters, the road commissioner had refused to do more blacktopping until floods could be controlled. Four county roads were closed four or five times a year, cutting off school buses and milk routes. With road ditches now able to handle the water runoff, one bridge has been taken out and two more are expected to be removed. Road damages now are slight, but in an adjoining untreated watershed a February 1962 flood resulted in a $3,000 expense to replace crushed stone on the roads.

Paul Garriott, who has shifted his corn acreage to truck crops, said: "I wouldn't be growing factory beans if it hadn't been for the watershed project."

He has spent considerable money bulldozing the old bayous and tiling them out. He also plans to do some land leveling.

The work plan for the Elk Creek project estimates annual visible benefits at $1.89 for every dollar spent. But there are many rural area development fringe benefits, too: Dependable crops and higher profits mean the entire economy gets a boost. Every pool of water at structure sites provides an opportunity for fishing and other outdoor recreation. And, with better wildlife habitat, the State can increase deer, game birds, and other desirable wildlife.

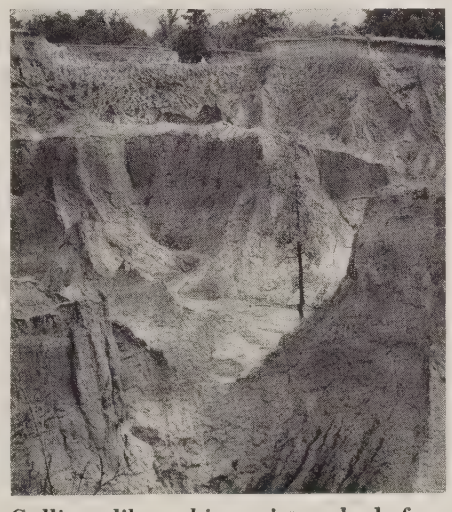
Yazoo-Little Tallahatchie Is a Paying Flood Prevention Project

By W. L. Heard

AN economic revolution already is spreading its benefits throughout the north-central fifth of Mississippi that lies in the Yazoo-Little Tallahatchie flood prevention project although the $70 million job is only about halfway to its 1970 completion target.

One of the biggest conservation jobs yet tackled in the United States, the Yazoo-Little Tallahatchie is one of 11 such projects in major river watersheds on which cooperative Federal-State-local work got under way after World War II, as authorized by Congress in the 1944 Flood Control Act.

More than 50 subwatershed projects, sponsored by local commissioners of water management and by soil conservation districts, already are in operation in the 4-million-acre project.



Gullies like this—pictured before planting to kudzu for flood control—once were common in project area.

Subwatershed accomplishments include 159 floodwater-retarding structures—about one-fifth of those needed — 9,000 desilting basins, and 1,500 miles of diversion ditches constructed and 800 miles of stream channel improved. Great strides also have been made in applying land-treatment measures that eventually will include more than half a million acres each of pastures and conservation crop rotations and almost a million acres of trees. Pastures have been established on more than 100,000 acres, and pines

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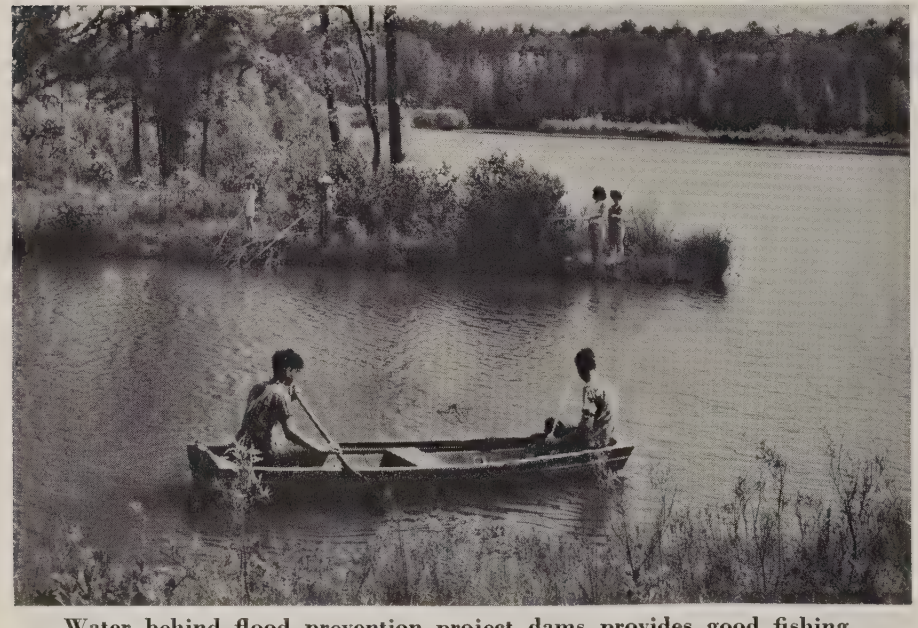
Floodwater-retarding dam protects valley land in foreground.



Water behind flood prevention project dams provides good fishing.

planted on still another 410,000 acres.

The Soil Conservation Service and the Forest Service provide technical assistance. Other agencies which have played a part in the flood prevention project's development include the U. S. Corps of Engineers, which established the first big dams at Enid, Sardis, Arkabutla, and Grenada; the Farmers Home Administration, and the Agricultural Stabilization and Conservation Service; the Mississippi Extension Service, and the State Board of Water Commissioners.

Cut across the north Mississippi hills in the Yazoo-Little Tallahatchie project counties that begin at the Tennessee line and extend well below Oxford, and you will see men harvesting timber out of young forests — timber for growing industries that employ hundreds of men and women who would have had to leave the region for lack of jobs only a few years ago. You will see fine livestock that has replaced the scrub herds of yesteryear grazing in improved pastures.

You may travel between hundreds of miles of roadbanks that formerly poured a crushing load of silt and sand into streams in the region, but which now are protected and beautified with kudzu and flowering shrubs planted to check erosion. Veer off onto the side roads that follow the ridges and you can see people from many sections fishing in reservoirs built for flood prevention. In 1962, 34,695 recreational visits were reported at 91 reservoirs.

Elsewhere in the many subwatershed projects which make up the Yazoo-Little Tallahatchie program, you can see crops growing on protected bottom land, vacation homes overlooking the lakes, and cattle auction barns packed with buyers.

By the time of the flood prevention project's beginning, close-cropping had so exhausted the once rich land that thousands of farmers were struggling on less than $300 in family income a year. Just one many-fingered gully in Panola County, called the "Jime Jones Gully," had ruined 21½ acres. The SCS estimated that all together 100 million tons of sand and silt gushed out of these northern Mississippi hills each year. Valley farmers, meanwhile, were losing one out of every five crops.

The 20,000-acre Askalmore Creek watershed, which rises above the Delta flood plain in Tallahatchie County, provides one of many examples of project-wide progress: The estimated annual flood damage was $46,000, and a single storm in 1957 did $95,300 worth of damage to crops, land, and improvements. But in 1963 the watershed project treatment measures completely controlled a comparable 4-inch rain.

Five Kansas Watershed Projects Joined in Flood—Other Benefits

By Leslie E. Johnson

FLOOD prevention is the major but not the only benefit rewarding the people in and around Chatauqua County for their persistent community efforts in making reality of their 10-year-old idea for watershed development in the Kansas portion of the Caney Basin along the Oklahoma line. Other accomplishments in the making include more and better water usage, outdoor fun, and, in short, better living all around.

The Kansas-Oklahoma Caney Council of Soil Conservation Districts was formed more than a decade ago to represent the interests of the people living within the upper part of the Caney River Basin. Clyde Clubine, Frank Ferguson, J. O. Henderson, and Walter Sears recall that they and their fellow original Council members were convinced watershed development was needed, because floods came too often, and sometimes there was too little water in dry spells. When the pilot small-watershed program came along in 1953, the Council was ready.

The group was able to obtain two projects, in the Aiken watershed on the upper end of Bee Creek in Kansas (see SOIL CONSERVATION, March 1964, p. 189) and on Double Creek in Oklahoma. The pilot watershed floodwater dams were ready in 1957 when drought-ending rains came in overgenerous amounts. They showed how upstream floods could be tamed and what a blessing additional water is.

Under the Kansas Watershed District Act of 1953, four watershed districts totaling 542,000 acres in the Kansas portion had been organized: The Grant-Shanghai, Bee Creek, Big Caney, and Twin Caney.

An interwatershed committee was formed, made up of representatives of each district board of directors, with Thad Kinnaman as executive secretary. The committee first employed an engineering firm to make aerial photographs of the Kansas portion of the basin for use in watershed planning. The cost was divided among the districts in relation to area, after deducting some contributions from towns in the area.

The committee set out to get priority for planning help under Public Law 566, the Watershed Protection and Flood Prevention Act, which had been authorized by Congress in 1954. In 1960, it applied for authorization to plan watershed projects in all four watershed districts, using $90,000 of newly appropriated State funds for the engineering phases of the work.

By 1961, five projects had been approved for Federal planning assistance—Bee Creek, Twin Caney, Grant-Shanghai, Big Caney, and the Middle Caney. All had been authorized by March 1, 1964, to receive Federal assistance for construction.

All together, the 5 Caney watershed projects, when completed, will include 78 floodwater-retarding reservoirs, 2 multiple-purpose reservoirs, and 45 miles of channel improvement. Three of the Bee Creek dams already are about three-fourths completed.

The Caney Basin's 5 watershed projects.

The author is assistant State conservationist, Soil Conservation Service, Salina, Kans.

Boy Scouts learning to swim in the Aiken Watershed reservoir.

Total project costs, including land treatment for watershed protection now in various stages of completion in the five watershed project areas, come to $13,324,000, with $10,662,000 Federal cost and $2,662,000 from other sources. Sedan, county seat of Chatauqua County, is financing a 660-acre-foot multiple-purpose reservoir in the Middle Caney watershed project, to provide water for its growing population and water supplies in drought years.

In the Twin Caney, the Quivira Council of Boy Scouts, which includes Wichita, is developing a 400-acre lake as part of the development of its 2,800-acre Scout Ranch as a wilderness camping site. The Council agreed to provide land, engineering, and construction funds with an aggregate value of $237,000 to cover its share of the lake's cost. Others, meanwhile, are exploring the recreational potential in different parts of the Caney watershed.

Thus are the water resources of the Kansas part of the Caney Basin being developed for multiple uses in addition to taming the floods that used to occur so frequently. A balanced system of large, intermediate, and small dams is being installed to establish a proper relationship between upstream and downstream interests in the basin. The benefits are widely dispersed, and everyone in the area stands to share them in one way or another.

Arkansas Watershed Team Speeds Flood Prevention and Recreation

By Hollis R. Williams

FARMERS and townspeople of Lawrence County in northeastern Arkansas figure their new Flat Creek watershed project will return upward of half a million dollars a year in flood prevention and related recreational and other benefits from the water developments and controls it has brought them.

Five floodwater-retarding dams and one structure specially designed to provide abundant water for wildlife and recreation have been built in the 24,000-acre project through local-State-Federal teamwork. The first one was completed in October 1961 and the last in September 1963. The reservoirs and yet-to-be completed 4½-mile-long floodwater diversion will intercept runoff from 99 percent of the uplands.

Also, about 75 percent of the conservation land treatment for water management and erosion control on watershed lands above the dams has been done by the landowners. Structural work remaining to be finished also includes 8 of the little better than 10 miles of Flat Creek channel improvement called for in the watershed plan.

When planning began in the late 1950's, aimed at better protection of the 6,200 acres of flood plain, project benefits were estimated at about $50,000. Although they were twice that amount when operations were authorized in 1959—because fish and wildlife benefits had been added under an amendment to the 1954 Watershed Protection and Flood Prevention Act—the State and local people also wanted a recreation park beside the 645-acre Lake Charles. That is the dual-purpose reservoir for flood prevention and fish and wildlife.

The author is deputy administrator for watersheds, Soil Conservation Service, Washington, D.C.

Money for park facilities was not in sight, but the Arkansas Game and Fish Commission already had bought 80 acres of land for the purpose; and when Congress in the 1962 Food and Agriculture Act authorized cost-sharing for this kind of recreational development in small-watershed projects, the Commission and the cosponsoring Lawrence County Soil Conservation District arranged to amend their plan to include the park.

Facilities now being established will accommodate up to 10,000 people a week in season, or an estimated 200,000 visitor-days a year; and the estimated eventual watershed benefits accordingly have been boosted to a whopping $400,000 a year, or eight times as much as when the project was conceived.

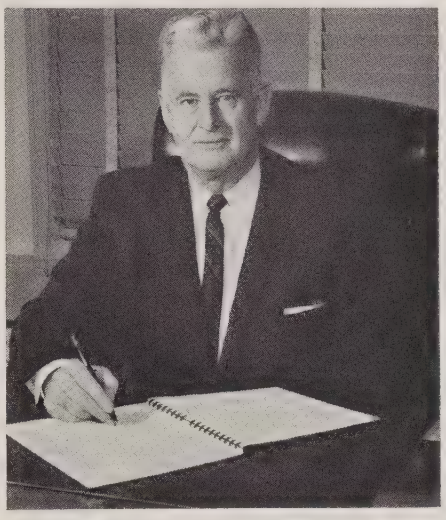
The measure of the Flat Creek watershed project is more a matter of the vision of its people who were willing to invest in full development of the area's natural resources than it is of size, or even of these impressive benefits. Take, for example, the late James F. Sloan of Walnut Ridge:

He helped pioneer the Tri-River Soil Conservation District organized by landowners in 1938 under the Arkansas State districts enabling act, the first such law in the Nation. Part of the present Lawrence County Soil and Water Conservation District was in that district, and part in the Moorefield district formed in 1939.

"Some day," Sloan declared as time after time he saw muddy water swirl out of Flat Creek and destroy crops on the fertile bottom lands, "we will treat the hill land that sheds its water so fast. We will build dams to hold back that floodwater, and we'll use it for many purposes."

He led the district program that started the land treatment immediately, but he had to wait until the midfifties before Congress authorized the watershed program that has made his prophecy come completely true. R. Sloan Rainwater, farmer and businessman in Walnut Ridge, succeeded to this local leadership when the watershed program came along.

When wildlife interests later were joined with the basic watershed program, fellow townsman Charles C. Snapp was chairman



Hollis R. Williams.

of the State Game and Fish Commission. His group sought water to flood 2,700 acres of lowland hardwoods on the adjoining Shirey Bay-Rainey Brake Wildlife Refuge, for the many ducks that visit the area during the winter. Under his leadership the Commission became one of the first State game and fish agencies to cosponsor a watershed project. Snapp is now a member of the board of supervisors of the Lawrence County Soil and Water Conservation District. Lake Charles bears his name.

Various other community, county, and State leaders have been active on or in support of the watershed project team, including everybody from the Governor and members of Congress and the State Legislature from this part of Arkansas to the Flat Creek Watershed Improvement District. State agencies have made major contributions from the project's outset.

The Game and Fish Commission spent more than $100,000 for fish and wildlife developments in the watershed, in addition to more than $300,000 it invested in the Shirey Bay-Rainey Brake refuge.

State Highway Commission contributions similarly will exceed $100,000. It re-routed 1.1 miles of State Highway 25 so the Lake Charles dam could be moved to the edge of the flood plain, where it could store water for fish and wildlife. The Commission also is building 2.2 miles of hard-surfaced roads and parking areas in the recreational development.

The Arkansas Publicity and Parks Commission, under new authority granted by the State Legislature, is contributing $60,000 for the minimum basic recreational facilities, and will operate and maintain the park at an estimated cost of $60,000 annually. It also will build a cottage for a caretaker.

Among Federal agencies, the Soil Conservation Service gave primary assistance in planning, construction, and cost-sharing. The Farmers Home Administration made a $30,000 loan to the Flat Creek Watershed Improvement District in 1963. The Forest Service planned the recreational facilities and helped with land treatment. The Agricultural Stabilization and Conservation Service, Ex-

Lake Charles while still filling, with work under way on park at right.

Lake Charles water supplies Hill Slough in wildlife area.

Visiting first dam completed (l. to r.): SWCD Chairman R. S. Rainwater, Rep. Wilbur D. Mills, Walnut Ridge Times-Dispatch Editor James Bland, Jr., Attorney Leonard Lingo, SCS State Conservationist William B. Davey, SWCD Supervisors Earl Sloan and J. F. Sloan III; and Dr. Edwin Dunn and W. H. Haley, Flat Creek Watershed Improvement District commissioners.

tension Service, Fish and Wildlife Service, and others also helped.

The local people actually made the greatest contribution—in leadership and services that cannot be measured in dollars, in addition to their actual financial investment on the project. Thus landowners put $150,000 into land treatment and gave $100,000 in easements and rights-of-way. Grading and sanding the swimming beach by the Lawrence County government is valued at $15,000. The sand was contributed by a local businessman. Outside wiring in the park, valued at more than $4,000, was contributed by the Craighead County Electrical Cooperative.

The fishing and hunting and other recreational facilities of the Flat Creek watershed project will be available to the people of the surrounding tri-State area of Arkansas, Tennessee, and Missouri. The project will provide new job opportunities in a county that has had underemployment; and it will increase rural and urban income, and help to stabilize the economy of an area much larger than the 24,000 actual project acres.

It is practical Rural Areas Development!

11th Watershed Congress Looks Ahead 10 Years

Watershed development during the next decade was the theme of the 11th National Watershed Congress at Little Rock, Ark., April 26-29, with the annual banquet address by Secretary of Agriculture Orville L. Freeman, and the opening keynote address by Deputy Administrator Hollis Williams of the Soil Conservation Service on the first 10 years' progress in watershed development.

Committee reports were the principal bases of discussion, on water quality; recreation, fish, and wildlife in watershed development; river basin planning; water rights, and the potentials of watersheds.

Little Sioux Flood Prevention

Helps Many Watershed Landowners

By Harvey R. Lindberg

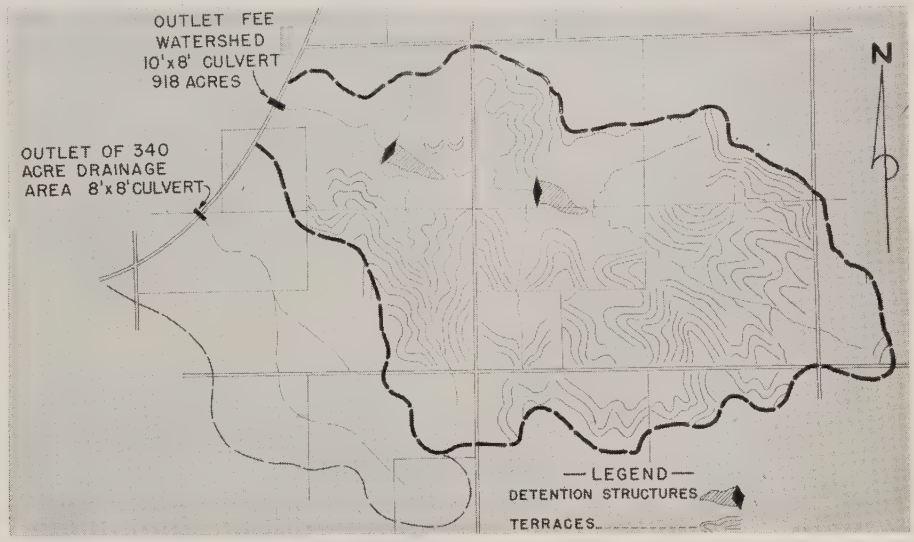
SEVENTY-FIVE landowners in the Cherokee Soil Conservation District in Iowa are enjoying profit and pleasure from six small watersheds they have protected and improved through the Little Sioux flood prevention program.

Working together, these neighboring farmers invested more than $25,000 to establish soil and water conservation measures on their land. They put another $25,000 into a fund, deposited with the district, that guarantees maintenance of the erosion control and detention dams built with flood prevention program assistance. Serious gully problems and rilling in cropland, flood damages, the need for water, and interest in conservation were the farmers' major problems.

Work in the first of these six watersheds was completed in 1950, among the earliest in the Little Sioux program. The latest was finished in 1961. The Cherokee County watersheds are midway of the 2,880,000-acre Little Sioux Flood Prevention Project, extending 135 miles out of southwestern Minnesota to the confluence of the Little Sioux River with the Missouri River approximately halfway between Sioux City, Iowa, and Omaha, Nebr.

Eight soil conservation districts are principally concerned in carrying out the Little Sioux project —one of 11 authorized in as many major river watersheds of the country by the 1944 Flood Control Act—and 4 other districts have some interest in the program. Forty-nine subwatershed projects had been completed by June 30, 1963.

The six subwatersheds in the Cherokee district are representative. They vary in size from 918



During Aug. 8, 1961 storm 340 untreated acres (l.) had 1,020 c.f.s. peak flow, while adjacent 918 treated acres in Fee watershed had only 410 c.f.s.

Detention dam on Walter and Robert Mortenson land, with diversions used to stabilize side gullies.

The author is work unit conservationist, Soil Conservation Service, Cherokee, Iowa.

to 2,220 acres, for a total of 8,000 acres. The smallest includes 8 farms and the largest 20.

These 75 farmers are contouring more than 4,000 acres of cropland. They built 67 miles of terraces and 28 acres of waterways. They seeded 11,000 rods of headlands and planted 20 acres of wildlife areas. They shifted 112 acres of hilly ground to permanent pasture and installed 2 dams and 5,000 feet of diversions. Those measures were all applied by the landowners with technical help of the Soil Conservation Service. Agricultural Conservation Program cost-sharing was obtained on many of the practices.

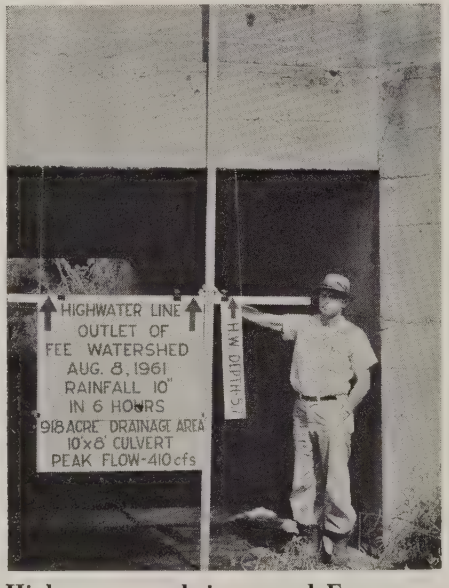
Then, through their soil conservation district, these neighbors asked for help on major gully control and flood prevention problems through the Little Sioux Flood Prevention program administered by the SCS. Fourteen gully control dams and 16 small floodwater-detention dams were built.

The detention dams also are providing both stockwater and recreation — hunting, fishing, and boating. The ponds formed by 13 of these dams are big enough to support fish. They vary in size from 1 to 8 acres, and have a total of 53 acres of water surface. Eleven have been stocked variously with bass, bluegills, catfish, and bullheads. Seven of the dams have water piped to a stock tank below the dam.

The supreme test for one of these small watersheds came on August 8, 1961, when 10 inches of rain fell in 6 hours in an area southwest of Quimby. Although the runoff was greater than the detention dams were designed for, no significant damage occurred to them, little damage was done to the cropland terraces, and terraces in meadow fields handled the storm with little or no overflow.

John Hodgodon, in the lower part of the watershed, said that a few years ago a 7-inch rain produced a flow that put 1 foot of water at his front porch, approximately 150 feet from the stream channel, but that the more recent 10-inch rain produced no overflow in the channel, which flowed at only about 50 percent of its capacity during the peak flow.

High-water mark of untreated 340-acre drainage area—1,020 c.f.s.



High-water mark in treated Fee watershed—only 410 c.f.s.

"Water runoff has been reduced to the point that fencing the creek bottom is no longer a problem," Harold Clark reported. "Terraces have checked the small gullies and made waterways possible. The top of the flood-detention dam gives me an all-weather lane to my fields. My son-in-law caught a 5-pound bass in the lake formed by this dam. My pond is used for both fishing and boating and provides stockwater for the pasture."

"There has been a steady increase in yields of all crops since we started our conservation program," Walter and Robert Mortenson commented. "Also, the dam in our west gully checked a serious threat to one of our feed yards. All the gullies are now protected waterways. Our pond serves as a standby source of stockwater. In the dry year of 1956, we pumped water from the pond to irrigate an adjacent field and supplied water for a neighbor's pasture."

Estimating that considerably more than 100 people fish and hunt in this small watershed every year, Keith Robeson observed that "duck and goose hunting has been tops in our watershed."

James Fee and his son-in-law, Kenneth Hoeppner, had this to say:

"Our well is now full of water, where before the watershed treatment a gully was draining it. Also, the terraces made it possible for us to use a more intensive rotation, and we used the pond to irrigate one field in 1956. This has increased our income. I have seen as many as 12 people fishing the pond on many days, and there are ducks and geese in the fall."

Doyle and Dean Simonsen added this observation.

"Watershed improvements have resulted in a big reduction in fence-maintenance costs. Our annual watershed maintenance payments are no larger than the annual saving in fence costs. We don't particularly like terraces, but they have cured the small gullies in our hill land; and ditches below are healing, because runoff water is reduced. Also, we now cross the flood detention dam to reach distant crop fields, and every once in a while somebody reports catching a big bass in the pond."

Washington Farmers Solving Problem of Too Much Water

By Everett Loreen and Herb Boddy

LONG-SUFFERING bottomland farmers near Snohomish in northwest Washington this year are tasting what they expect to be permanent relief from costly floods they have seen come and go just about every winter before.

Two flood projects, costing nearly $8 million, already have demonstrated their potential effectiveness for ending winter inundations that made an "inland sea" of their fertile valley. These two community-initiated and -run watershed projects—Marshland and French Creek—on opposite banks of the meandering, trouble-bent Snohomish River, are designed to protect 184 farmers and some 12,000 acres of truck and dairy lands.

This spring, for the first time, they are in position to plant new and better-paying vegetable crops and pastures. And with wet lands high and dry, yields of old crops can be stepped up and low-producing lands put in top working order. Changing from dairying to higher-valued row and drill crops could increase farm incomes in the valley by $500,000 a year. The yearly flood damage saving resulting from the projects is estimated at $265,000. All together, farm and urban people in the valley and surrounding areas thus will share project benefits figured at more than three-quarters of a million dollars a year.

Floods have caused destruction, and even death, in the Snohomish Valley since pioneers first settled there. Swelling waters from the Snohomish and Pilchuck rivers, along with neighboring streams, flood the French Creek and Marshland farming areas as often as 10 times a year. Tidal action from close-by Puget Sound on the west below Everett adds to the flows and increases the length of time floodwaters stay on the land.

To reduce floods, farmers in the past had organized drainage, diking, and improvement districts and installed low dikes, a network of drainage ditches, and small pumping plants; but the Snohomish still poured over their lands. They finally found a practical solution in cost-sharing and engineering opportunities offered through the 1954 Watershed Protection and Flood Prevention Act (Public Law 566).

French Creek people agreed to back a flood prevention project under sponsorship of the Snohomish Soil and Water Conservation District, French Slough Flood Control District, and Drainage District No. 4 of Snohomish County. Across the river, Marshland farmers moved ahead with plans for a project serving their area, with the soil and water conservation district, Marshland Flood Control District, and Drainage Districts No. 1 and 2 as sponsors.

Soil Conservation Service watershed specialists prepared plans, including engineering designs, economic evaluations, and cost estimates. The projects were cost-shared with $2.8 million of local and State funds and around $5,200,000 of Federal funds.

The Marshland flood works include a new 6½-mile long floodway, 3 to 80 feet wide, and another 2-mile floodway, expected to be in by 1966, that will drain the area around the Snohomish airport. Also to be completed by 1966 is about 8½ miles of new or enlarged, grass-seeded dike running along the south bank of the Snohomish River to an already completed pumping plant at Lowell.

The Marshland outlet structure, now operating, has six pumps, with a total capacity of 262,000 gallons a minute, which replaced four other pumping stations in a 4-mile stretch between Snohomish and Lowell. These smaller pumps can remove normal drainage waters from the 6,000 acres of lowland they serve. There also are four manually or automatically controlled floodgates.

When the water level in the river is lower than it is in the floodway, accumulated rain or snow runoff water flows by gravity off of the land in the floodway through the floodgates into the river. If the water level in the river below the floodgates is higher than it is in the floodway, the pumps lift the excess water out of the floodway over the floodgate structure into the river. The pumps operate at different levels and times in a sequence that moves the water down the floodway and through the outlets.

Structural measures on the French Creek project include: Reconstructing 2 miles of channel and building about 4 miles of dikes along the Snohomish and Pilchuck rivers; replacing a discharge pump on French Creek with now completed pumps along the Snohomish River bank; and 1 mile of floodway.

The French Creek outlet structure is similar to the Marshland plant except for its larger pumps of pumping capacity of 300,000 gallons a minute, and for fish

The authors are soil conservationist, Snohomish, Wash., and field information specialist, Berkeley, Calif., both of the Soil Conservation Service.

PROBLEM.—Flooded pasture and crop land in Marshland area, with French Creek watershed in background.

screens to protect migratory and sports fish. It has six floodgates.

With the flood hazard reduced, more effective onfarm drainage is possible in the Marshland and French Creek areas, as was borne out this year when new drainage channels ran bankfull, but there was no flooding of the adjacent land they were installed to protect. Because most of the conventional main ditches are not deep enough to drain wet lands, farmers in the Marshland area plan to install around 90 miles of closed and 12 miles of open drains in the next 10 years; and French Creek farmers plan to lay 165 miles of closed drains and dig about 10 miles of open ditches. Much of this work will be cost-shared with Agricultural Conservation Program funds.

Good drainage means longer growing seasons and reduces the marsh-type vegetation crowding out grasses and legumes needed for dairy cattle. The valley's chief cash crops—peas, corn, and broccoli—can't be grown on poorly drained land. With good drainage outlets, farmers can grow them in their rotations. Land preparation, fertilizing, and seeding now can be planned on a time schedule, and tillage is much less costly when the water level is controlled and soil is in shape to be worked.

Food processors and farmers welcome the projects, because they will open the way for a wider variety of cash crops. The economy of the Snohomish Valley should improve accordingly with wider choice of crops; and labor income in nearby processing plants is expected to increase.

Frank X. Bueler, Drainage District No. 1 commissioner and a Marshland farmer, puts it this way: "We have some of the best soil in the country, but we can't use it up to its producing ability."

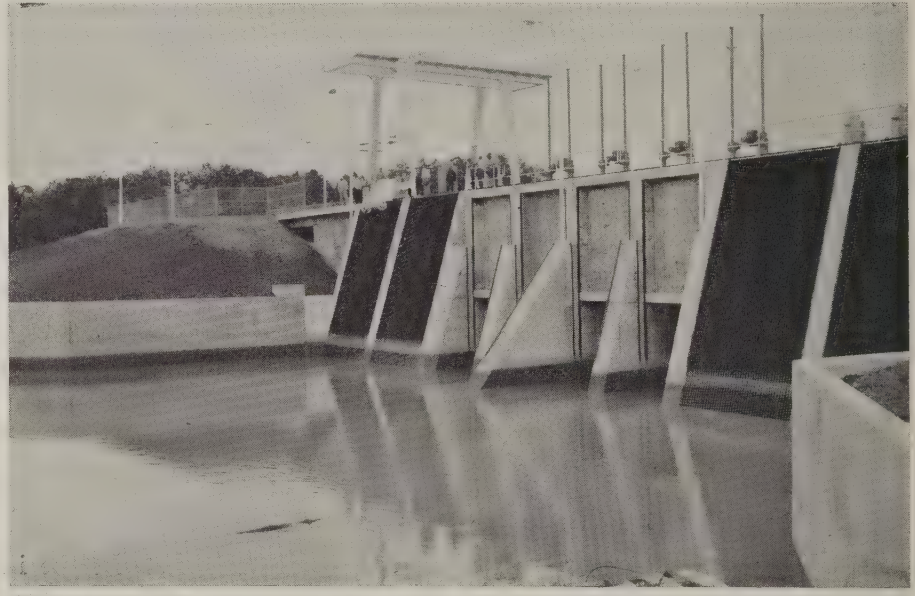
Clarice Cedergreen, French Creek farmer and frozen foods processor says:

"The end of floods will enable us to grow cash crops on other acreages profitably."

"The greatest benefit from the projects will be the assurance that we won't be flooded out at every rise of the river," observed Chris Hansen, a commissioner of Drainage District No. 2. "The county will have less costly emergency repairs to roads and bridges, and public utilities will be helped. Government agencies helped us during flood disasters in the past. With the projects in, we are sure we won't need this help again."

Farmer Joe Crabbs commented: "Annual seedings are often needed because of prolonged overflows. We'll be able to choose grasses and legumes to fit our dairy enterprise."

Added Norman C. Wilson, Marshland farmer and chairman of the Snohomish district: "The winter water table will be lower, enabling us to grow better grasses and legumes."



SOLUTION.—Marshland drainage outlet structure with 6 pumps and overhead crane.

Snow Survey Reports Help West In Years of Floods or Drought

By R. A. Work and William G. Shannon

MITIGATION of flood damages is among the major benefits that rural and urban communities gain from monthly winter snow surveys climaxed in April water supply forecasts for the West. So is the avoidance of crop-planting losses irrigation farmers might suffer in short-water seasons if they did not have this advance information to guide them.

The water supply forecasts for each snowmelt runoff provide a basis for more efficient use of water in the Nation's western areas. They are made in advance of the actual melt, or from January to as late as mid-June in some high mountain areas where snow falls late. The snow forecasts thus give water users and flood prevention authorities some time in which to plan for releasing, holding, or otherwise altering water storage in reservoirs used for hydroelectric power, flood control, irrigation, and other purposes.

That is why the Soil Conservation Service coordinates snow surveys made by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Geological Survey, and other Federal agencies, departments of State government; irrigation districts, soil conservation districts, power companies, and others.

Its detailed reports on snow water conditions as they affect prospective streamflow and reservoir storage are made available immediately after the measurements are taken, as soon as possible after the first of each winter month. They are made on approximately 1,400 carefully located and marked SCS snow courses in major storm paths, by California on its separately operated 300 or more courses, and by British Columbia on its more than 100 snow courses. Flood control districts, the U. S. Weather Bureau, and others also receive the information.

The Soil Conservation Service does not forecast floods; but its findings on the amount of water stored as snow on mountain watersheds surveyed are used as flood prospects guides by those agencies and others concerned. Also used are Geological Survey stream-gage measurements, Weather Bureau precipitation and other reports, and all related information which make up the water supply forecasts made West-wide each April.

Based upon the water supply forecasts, savings from flood damages by reservoir control on these Columbia Basin streams are estimated to have been about $70 million during the 7 years from 1956 through 1962 alone.

Similarly, seasonal snowmelt forecasts are drawn upon the operation of reservoirs on the upper Colorado River, at Lake Mead on the lower Colorado, on the upper Missouri River, and on the Rio Grande. Snow forecast information also is used in the management of many smaller reservoirs, both publicly and privately owned, including watershed protection and flood prevention project reservoirs farmer and community groups are building in yearly increasing numbers on small tributary streams.

Most of these small-watershed impoundments are primarily for flood prevention, though more and more of them are being designed to serve such other purposes as recreation, municipal and industrial water supply, and irrigation. Most large reservoirs built in late years in the Western States likewise are multiple in purpose; that is, for irrigation, industry, municipalities, power, navigation, or recreation—and flood control. But to serve its flood prevention purpose effectively, it is important that the amount of water that will flow into a reservoir during the runoff season be known as far in advance as possible.

Snow surveys are made in 13 States: Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming. The Alaska surveys have been primarily to build up, year-by-year, cumulative waterflow information for guidance in future development of storage.

Snow survey information is used, also, in Kansas, Nebraska, North Dakota, Oklahoma, and Texas, as well as in regional and national water planning.

New snow surveying techniques are making it possible to gather more dependable information from wider areas (see SOIL CONSERVATION, May 1959). These include remote mountain snowfields that were inaccessible to the men (and a few women, too!) who had to travel on skis or snowshoes to the snow courses from the time the first courses were laid out in 1910 until recent years. Track- and ski-type over-the-snow machines

The authors are head, water supply forecasting unit, Portland, Oreg., and civil engineer, Engineering Division, Washington, D.C., both of the Soil Conservation Service.

Top (l.).—Section of sampling tube with wrench for pushing it through deep snow. Center (l.)—Snow surveyors Bordon Goodwin (l.) and John Masterson check an Arizona soil moisture station. Bottom (l.)—Snow's weight on anti-freeze-filled rubber test "pillow" will operate adjacent water-content recording device. Top (r.).—Measuring next summer's snow water on Mount Hood in Oregon. Center (r.).—April's melting snow water on its way to the valley in Idaho. Bottom (r.)—Idaho floodwater did $120,000 damage in irrigated area on Snake River.

were the first break-through, to which aircraft was added. Today, also, more than 200 special snow depth measuring markers are read in midwinter by snow surveyors flying low over them. Meanwhile, short-wave radio long has been used to speed reports from snow surveyors at isolated courses to compilation centers.

Approximately 300 soil-moisture measuring stations, consisting of electronic resistance devices sunk as deep as 6 feet beneath the ground surface, are checked

The SCS also maintains about 100 precipitation gages which measure the total snow and rain which falls at snow courses. Taken together, this total amount of moisture received, the amount of the snowpack remaining on the surface, and the amount of water that still may or may not be needed to saturate the soil be neath the snow govern how much water may be expected in the streams and valleys below.

Telemetering systems are being tested, meanwhile, which automatically report the snow survey information from remote areas to designated receiving points.

Colorado Small-Watershed Dams Stop Floods—Bring Recreation

By Dearl B. Beach

PEOPLE from Denver and the counties south and east of Colorado's largest city already are reaping major flood-prevention and recreational benefits from floodwater-retarding dams in the Big Sandy watershed protection project.

The dams saved farmers, townspeople, and other property owners from what otherwise would have been costly flooding down Big Sandy Creek last August. And 150 to 200 people from Denver, Littleton, Colorado Springs, and other points came on favorable weekends to fish or go boating or water skiing behind the Ramah Dam after it had been completed only 11 days before, on August 2, as rains first broke the drought which had plagued this and other parts of Colorado.

When storm clouds rolled over the headwaters of Big Sandy Creek northwest of Calhan on August 13, residents as far east as Ramah, Simla, and Matheson watched and remembered the floods in August 1954 and July 1956 that caused thousands of dollars in damages to agricultural land, highways and railways, and other property. But this time there was no flood, even though some observers said more than 3 inches of rain fell during the late afternoon storm.

The reason was that 4 of the watershed project's 14 strategically located flood-retarding dams caught and held the storm water long enough to keep the Big Sandy from flooding land and property along its course. Operation of the flood-retarding dams has been so effective that when two more storms, that formerly would have produced minor floods and damages, occurred on August 31 and on September 6, many residents never even realized a threat existed. By September 1, 1963, all but two of the dams had functioned at least once after rains; and six had functioned two or more times during August.

It was after the floods of the midfifties that the Board of Supervisors of the Big Sandy Soil Conservation District, with the support of the local citizens, and the State Soil Conservation Board applied for Federal help in developing a watershed protection and flood prevention project under Public Law 566. Technical assistance in project planning was given by the Soil Conservation Service of the U. S. Department of Agriculture; and the project was authorized in 1958 to receive financial help for installing the structures.

Under a supplemental authorization in 1961, the Ramah Dam 2½ miles west of Ramah, was planned to include fishing and recreation with its flood prevention purpose. The Colorado Game, Fish, and Parks Department agreed to share half the cost of the permanent storage for a 500-acre-foot fish pool in the dam—the only water stored by the 14 dams. All the dams have tubes through them, and floodwaters are released slowly over a period of days, thereby reducing flood damages.

With the exception of the Ramah Dam site and the adjoining public-use area, project farmers and ranchers donated the damsites and flowage rights to the Big Sandy Soil Conservation District. They then set out to apply the required soil and water conservation practices to protect the watershed above the structures and improve their grazing and cropland. Most of the more than 150 operating units in the nearly

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Water rising in Big Sandy Creek at Elbert County bridge during July 1956 flood at Simla, Colo.

New Ramah Dam with floodwater held back after heavy rain along the Big Sandy in August 1963.

200,000-acre watershed project area are district cooperators.

The project's estimated total planning and construction cost was $1,522,260, of which $1,055,000 was the Federal share and $467,260 the local contribution, including the sponsor's share of the permanent pool at Ramah Dam. Benefits, exclusive of the recreational values at the Ramah Dam, are estimated at $42,900 a year.

Maintenance of the dams, estimated to cost $4,000 annually, is the responsibility of the Big Sandy Soil Conservation District. This expense is being shared by the Chicago, Rock Island, and Pacific Railroad, which parallels Big Sandy Creek, and by El Paso and Elbert counties and the Colorado Game, Fish, and Parks Department.

The Colorado Department has plans for a recreational area on the north side of Ramah Lake. Facilities will include a parking area, picnic sites, comfort stations, and a boat dock. The lake already has been stocked with both trout and warm-water fish.

The Big Sandy Creek project, with the exception of the Ramah Dam, is similar to other watershed protection and flood prevention projects undertaken by Colorado citizens and their organizations at Trinidad, Wray, Kiowa, Greeley, and Castle Rock. Other projects which have been approved are at Limon, Grand Junction, and Olathe.

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Soil Conservation

SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

Soil Conservation
25 Years Ago

"It was in the fall of 1933 that the Soil Conservation Service—then known as the Soil Erosion Service—began operations on this 92,000-acre watershed (Coon Valley soil-erosion control demonstration project near La Crosse in southwestern Wisconsin):

"Today, it is clearly evident that the battle against the erosion menace is being won on the demonstration farms. Literally thousands of small shoestring gullies have been plowed in and completely healed as a result of terracing, contour strip cropping, and the other phases of the program. Dams and trees have effectively controlled larger gullies. Farmers in the area will tell you that erosion losses on controlled land are today but a fraction as great as they formerly were.

"From the standpoint of farm management, the shift in land use has been the outstanding change brought about by the conservation program. A recent survey revealed that on 374 farms included in the demonstration program, the total acreage of cultivated land has been reduced from 16,750 to 15,490 acres, a reduction of 7.5 percent."

COVER PICTURE.—Spiritual values are prominent in the lives of good stewards of the land. Their physical reality is evident in the well tended grounds and conservation-treated landscape presided over by the Big Elk Creek Church in Chippewa Soil Conservation District, Wisconsin.

VOL. XXIX, NO. 10 MAY 1964

CONTENTS

Page

219 Soil Stewardship Week
By Donald A. Williams

221 "A Better World" Is Aim of Vacation Farms for City People
By Adrian Achtermann and Larry R. Decker

223 Great Plains Conservation Program Represents Good Stewardship
By Roland Willis

224 Soil Surveys Basis for Good Soil Stewardship
By Bernhard A. Roth

225 Passion Play Director Also Good Soil Steward
By Perry Eberhart

227 New Horizons in Conservation—Excerpts From SCS 1963 Annual Report

235 Land Today Has New Values
Excerpts from address by Orville L. Freeman

236 Girl Scout Cookies Help Build Lake
By J. R. Sasser

237 People's Souls and Soils Concern Minister—*A Profile*
By Walter S. Allen

238 Beach Owner Stops Waves' Damages
By Gordon S. Smith

240 Book Review

Soil Conservation

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"A Time of Reflection"

Soil Stewardship Week

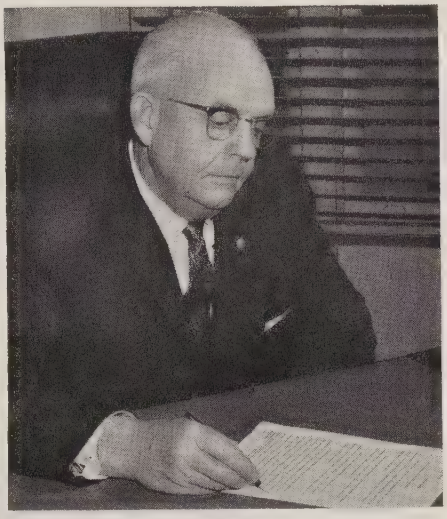
By Donald A. Williams

SOIL Stewardship Week—May 3 to 10—is properly a time of reflection and contemplation by conservationists everywhere.

The basic resources of soil and the water which make the soil productive of all plant and animal life are the foundation of our entire economy. Any activity by which we live from day to day or grow and progress toward a fuller life on this earth inevitably must be related to the use of these basic resources.

Better to guide all of us, on the land and off, in the optimum development of our soil and water resources for their most productive multiple uses as required by our fast-growing and more demanding population, it is important to reflect upon the long strides we have made in their better stewardship on privately owned lands in comparatively recent years.

That is: since Congress 35 years ago authorized establishment of 10 erosion control experiment stations on important types of farmland throughout the country; since the Soil Erosion Service was set up (in the Department of the Interior) and the first soil conservation demonstration project was started in 1933; since the renamed Soil Conservation Service was made a permanent agency in the U. S. Department of Agriculture by an act of Congress in 1935 (Public 46) declaring soil and water conservation to be national policy; since farmers and ranchers in 1937 began organizing their own soil conservation districts under State enabling laws; and since Congress in 1954 broadened earlier flood prevention and small-watershed protection authorizations in Public Law 566.



Donald A. Williams.

In the meantime, soil and water conservation has moved ahead through Great Plains shelterbelt tree planting, farm forestry, water facilities, land utilization, Great Plains conservation, and other programs, including successive programs authorized by the early Agricultural Adjustment Act and its successor Soil Conservation and Domestic Allotment Act. The overall results of all these undertakings together, carried on in the main through local, State, and Federal cooperative efforts, defy accurate statistical accounting. Their extent can be measured best by traveling up and down and across the country, by air or on the ground. Their impact is felt in more profitable and satisfying living enjoyed by hundreds of thousands of farm and ranch families and in the visibly improved economy of thousands of communities that are benefiting from soil conservation district, small-watershed, and related conservation programs in their areas.

If we are to profit from our

The author is administrator, Soil Conservation Service, Washington, D. C.

Gullies like this one in 1956 on Victor Holstein's Washington County, Nebr., farm long were the trademark of soil erosion. They may not have inspired poets, but they are credited with having moved Patrick Henry to say: "He who heals the most gullies is the greatest patriot."

many past successes, hold our gains, and assure the security of our soil and water resources for the future, it is even more important that we contemplate the big and many-sided conservation job that still lies ahead. With the increased demands for attention to watershed, rurban, and other developments in the national action program of soil and water conservation, we have to redouble our efforts to keep on top of that job.

The ever-broadening community concept of conservation, expressed in soil and water conservation district, small-watershed, rural-urban, and other approaches, confirms the fact that we must keep up to date. This is 1964; we have to gear ourselves to 1964 conditions, in conservation research, education, community leadership and action, technical methods, and cost-sharing or other financial assistance.

At the start of the soil conservation program, the emphasis was on halting soil erosion—which is no less of basic importance in today's soil stewardship conservation effort. But, as we progressed in conservation technology and experience, we began to pay more attention to sustaining and building soil fertility. Then came renewed emphasis on water management, although the watershed approach in dealing with problem areas as units, rather than relying entirely upon spot treatment of individual farms, was recognized from the outset.

Whether it is in soil and water conservation district operations, in small-watershed projects, through the Great Plains Conservation Program, or in Rural Areas Development, Resource Conservation and Development, recreational or other undertakings, definite basic principles must govern how we treat and manage the resource base. By soil and water conservation today —whether it is on agricultural land, on land occupied by suburban housing or by industries, on land set aside and developed for recreational use and wildlife, or what have you—we mean:

Proper land use, protecting land against all forms of soil deterioration, rebuilding eroded and depleted soil, and building up soil fertility; improving grasslands, woodlands, and wildlife lands; conserving water for agricultural and other uses; flood prevention, reducing sedimentation in streams, lakes and reservoirs, and harbors; proper irrigation and drainage; and making efficient, profitable, and satisfying use of all our land and water for greater human benefit and enjoyment.

The use and treatment of each acre of land within its capabilities and according to its need continues today, as it has been from the beginning, the bench mark of modern soil and water conservation technology. This simply means using all of our land for the kind of production for which it is best suited—and needed. In short, today's conservation concept takes in all the resources of the community, the State, and the Nation.

There is no call to compromise the basic principles that have proved themselves over the years. Expanding demands upon our land and water resources only intensify the importance of soil surveys to

Uncounted thousands of landowners have demonstrated their "patriotism" in ways similar to that used by Holstein, who a year later had converted the gully into a useful graded waterway protected with grass to drain 400 acres safely.

determine land capabilities, of conservation planning, and of treatment and use of all our lands within their needs and capabilities.

It is of vital concern for all of us, as stewards of the soil in our own right or as taxpayers and consumers of the land's bounty, to pay careful and deliberate attention to the opportunities and responsibilities bearing upon the future course of natural resources management and of the individual and public welfare tied in so closely with these resources. We are faced on every hand with new and growing problems affecting those resources and our welfare. These include, besides our fast-increasing population, competition for space for living and for recreation; multiplying demands upon economically available water supplies by agriculture, industry, municipalities, and recreational interests; problems of soil erosion and of stream pollution and sedimentation; and so on.

Today is the time to plan and to take remedial or preventive action, as may be necessary, with respect to remaining land, water, timber, and wildlife resources—to use the "tools" that are available for resource development in cooperative efforts involving agencies of the local community, the State, and, where necessary, the Federal Government.

The agricultural, commercial, industrial, and recreational potentials of America are almost without limit. Included in their base are the natural and human resources of every State, county, and local community. The full development of those potentials rests in the hands of farmers, industrialists, and businessmen, civic leaders and public officials, teachers and clergymen, other professional people, and those in the ranks of labor. In their hands, in any area, lies a future that can be better than any past we have ever known.

They—all of us—are the stewards of our soil!

"A Better World" Is One Aim of Vacation Farms for City People

By Adrian Achtermann and Larry R. Decker

THE 371-acre Floyd Jones farm in southwestern Holmes County is a model of conservation soil stewardship and one of Ohio's growing number of farms providing summer vacation accommodations for city people. The Franklin Fuss farm in Carroll County, the second county east of Holmes County, is another.

The Joneses were among 10 farm families in the Holmes Soil and Water Conservation District who organized the Holmes Hills Vacationland Association in the spring of 1963 to add to their income by taking in vacationers from the city and helping to acquaint them with living "down on the farm." Families visiting those farms last year learned quickly that there was a great deal to enjoy—and to learn. Fishing, camping, riding, hiking, and helping with the farm chores were among the experiences the visitors had during their stay.

"I never realized how much a man had to know to operate a farm," Frank Clover from Canton said of his farmer host. "Why, it takes the organizational ability of a corporation officer to run a business like a farm. And the amount of work that he and one hired man do in 1 day's time is unbelievable!"

Jones, his wife, and four children are active in community, church, and county activities. He has been on the district board of supervisors for 11 years.

The Joneses learned, too, from their visitors. As Mrs. Jones said afterward: "It was such a fine experience for our children to make

Christine and Becky Clover and Danny Jones are pleased at their success at getting close to Rusty, the pony.

Guest Christine Clover takes her sister Becky and Danny Jones for a boat ride on the farm pond.

The authors are work unit conservationist, Millersburg, and work unit conservationist, Carrollton, both of the Soil Conservation Service, Ohio.

new contacts and learn about kids from cities.'' They especially enjoyed one family that had a gifted 9-year-old blind daughter. She played the piano for the Joneses, and the three Jones girls read stories for her; and both families got a better understanding of the countryside by describing for her things that most people hardly notice on a farm.

Mrs. Jones plied her summer visitors with roasting ears, fish fresh from the conservation farm pond, home-grown beef, and all the fresh milk they could eat. The guests worked up hearty appetites walking through the conservation-treated fields, swimming, and using outdoor recreation facilities provided for them.

The Joneses' guest have ranged from businessmen to mothers with their children, from as far away as Texas. Some expressed surprise at the complexity of the farming operation. One man from Cleveland, for example, said he was startled to find that cows had to be milked twice a day! Another Cleveland family came back for the Holmes County fair. An Akron fisherman reflected the reaction of a number of the visitors:

''The fishing here is as good as any place I have seen. The quiet and relaxed atmosphere is something that I haven't really had for some time.''

''With the success that we have had in our first year of offering farm vacations to city people, it is quite evident that there is a need for this,'' Jones has concluded as he goes into the second summer in the farm vacations business. ''We will continue, and try to encourage our friends and neighbors to offer their homes and themselves to others. This way, we help to build a better image of farming as well as learn about city living. We all are striving for a better understanding of our fellow man. In this program, we are trying to do our part in bringing the rural people and the city people closer together for a better world in which we live.''

In Carroll County, 11 vacation farms are listed in a brochure distributed yearly by the Carroll Vacationland Association to outlets in Akron, Canton, Cleveland, Columbus, and in Pittsburgh, Pa. More than 5,000 were sent out last year, and 7,000 were printed this year. The Association idea started with the county's own rural people.

In 1962, there were thirty-five paid farm guests, 200 in 1963, and reservations have been piling up for 1964. Most are by the week, but some vacationers prefer just weekends. Rates run about $40 a week for adults and $25 for children. As many as 80 persons were handled, in 4 months, by 1 farm last year. Figuring an average family of 4, this meant about $2,600 extra income.

The Carroll County hosts also find most vacationers are interested in the operation of a farm, with ''haying time'' a favorite.

''I almost had to take a combine apart to show one fellow how it worked.'' Franklin Fuss, who has a 174-acre dairy farm north of Carrollton, said.

The Fusses have had people all the way from New York. Mrs. Fuss said most all of the women guests like to work in her garden.

''We are thinking of going into a year around business, by putting in a ski slope and a place to skate and toboggan,'' Fuss explained. ''With farming the way it is, and getting tougher, it is difficult to make a decent living. Recreation will be the answer for some of us.''

TRAVEL TO REMEMBER

As far as the good grass goes, this picture could have been taken in 1861—when travel was slower but conservation came more naturally than today—instead of during the Kansas Centennial. It was taken during a rerun of the Butterfield Trail, on the Charles Stewart farm southeast of Quinter in the Gove County Soil Conservation District.

◆

Under normal conditions, 50 percent or more of the water lost during the growing season is through evaporation from the soil surface.

Great Plains Conservation Program Represents Good Soil Stewardship

By Roland Willis

GOOD soil stewardship is the essence of the Great Plains Conservation Program whose Federal cost-sharing provisions already have helped some 14,000 farmers and ranchers in 10 States to arrange for planting grass on about a million acres of cropland that was threatened by wind erosion.

Plains ranchers meanwhile have reseeded half a million acres of wind-damaged or threatened grazing land since the program began actual operations late in 1957. Stockwater developments, irrigation system improvements, and other conservation measures aimed at forestalling future "dust bowls" and dispossessed families like those in the 1930's also are going onto the land in soil conservation districts and watersheds with GPCP help, from North Dakota to Texas.

The program is administered by the Soil Conservation Service. Local soil conservation districts have furnished leadership from the beginning; and other agricultural agencies—Farmers Home Administration, Agricultural Stabilization and Conservation Service, and the Extension Service—all have helped the people who own and operate the land.

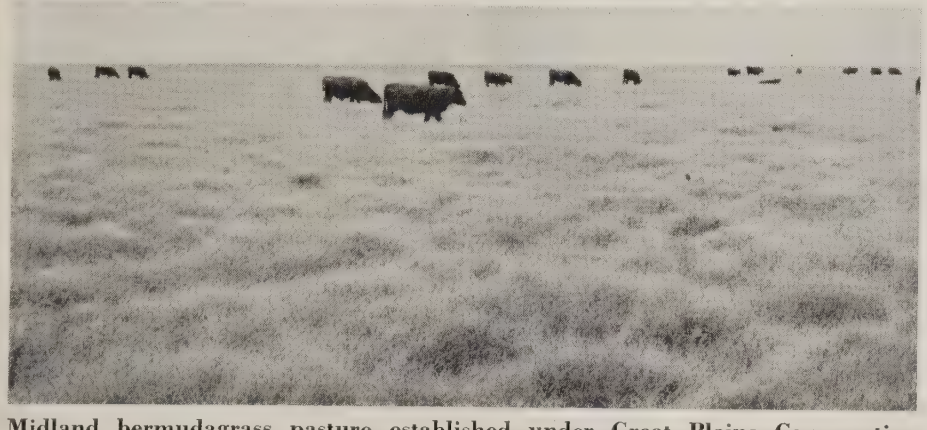
The program was tailored especially for areas like that around Lubbock, Tex., for example. In past years, this part of the Texas High Plains earned a name as a wind erosion area. Farmers here grow cotton and grain, both on dryland and under irrigation—and cotton land, without cover, blows in the winter.

The irrigated land has problems of its own including loss of soil and water waste from rainstorm runoff and unretarded flow of expensive irrigation water, which comes mainly from wells. Rangeland, too, suffers from wind erosion, particularly in drought years; and brush has moved in on thousands of acres, using up soil moisture and crowding out grass needed for livestock forage.

Thousands of farmers in 11 counties around Lubbock recognized these problems and were eager to fight them by switching from row crops to grass and livestock or with other conservation measures; but there was the matter of the cost, sometimes high. They had to do it as they could. Changing to grass and livestock, to illustrate, means the interruption of income from the land involved for a year or two. Not every operator can finance even such a temporary loss on his own.

Grassed waterway, terraces, and contour farming in Texas.

A farmer in the Lubbock area was one of the first three in the Great Plains to enter the new program, in late 1957. In this area alone, 1,052 farmers and ranchers, whose units total 973,950 acres, developed complete soil and water conservation plans in the ensuing 6 years, more than 200 of whom have completed their plans. Cost-sharing under the GPCP is only for the contracted acreages and practices on a participant's farm or ranch, but the whole unit must



Midland bermudagrass pasture established under Great Plains Conservation contract on Horace Gilmore farm, Morton, Tex.

The author is area conservationist, Soil Conservation Service, Lubbock, Tex.

have a conservation plan to be eligible.

At the same time, cost-sharing obligated in the 11 counties totaled nearly $4 million, about $1 million of which has been paid as owners completed steps in their plans.

Getting erodible cropland, which was not paying its way, into protective and profitable grass cover, is one of the main objectives of the Great Plains Conservation Program—and one vitally affecting the economy of the Lubbock and other areas. There has been 16,000 acres of this cropland conversion successfully done in this Texas area. As good pasture or range, this land no longer blows when the wind is high; and it is contributing to the stability of the individual farm family and to the economy of the community.

In an area of widely varying rainfall, averaging 19 inches a year, terraces with grassed waterways are among other practices Lubbock area farmers and ranchers are using in their stewardship of their soil. Thus where farms have been troubled by rapid runoff from neighboring land, building diversion terraces sometimes is the solution.

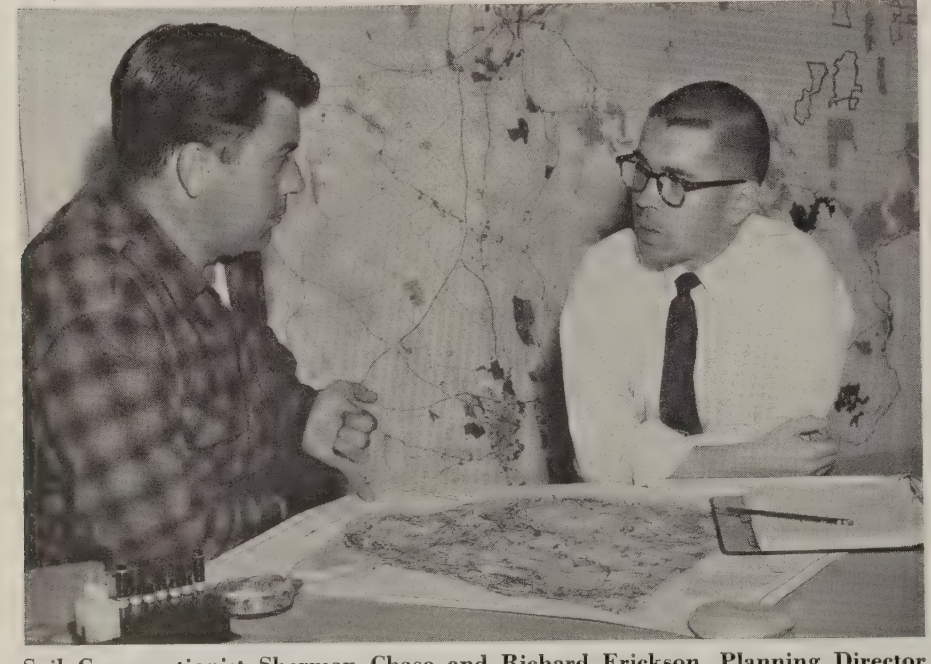
A complete conservation cropping system, based on the capability of the land and its needs, is applied by the producer to improve and maintain the productivity of his soil. Contour farming is winning wide acceptance as a measure for protection of the land and for more efficient farming. This practice includes the management of crop residues to help prevent wind erosion and reduce evaporation. Contoured furrows hold normal rain and snow water on the land, with terracing lending support in high intensity downpours.

As farmers turn more to livestock, they must add stockwater facilities. On rangelands, they drill wells and build ponds for water. Cross-fencing helps in the conservation management of their grass; and brush control has been shown to be a dividend-paying investment.

Soil Surveys Basis for Good Soil Stewardship

By Bernhard A. Roth

GOOD soil stewardship today is based more and more upon soil surveys which tell both farm and city people whether their land is suitable for crops or building they may be planning.



Soil Conservationist Sherman Chase and Richard Erickson, Planning Director of the Southeastern Connecticut Regional Planning Agency, discuss soil map for a town in the New London Soil Conservation District.

Protection from chaotic development on ill-suited areas is seen, for example, in widespread action taken by Connecticut and Rhode Island town planning bodies to gather scientific soil information before moving ahead.

Nearly half the townships in Connecticut and a third of those in Rhode Island have obtained specially prepared soils maps of community lands from the Soil Conservation Service.

Maps defining soil areas suitable or limited for housing, industry, recreation, and other community uses already have been furnished to 78 of Connecticut's 169 townships. They cover 1,388,632 acres. Similar aid has been supplied to 10 of Rhode Island's 32 towns, where the areas mapped for community guidance total 175,910 acres.

Soil surveyors in the field are compiling information for 15 more township planning councils that have forwarded requests to the SCS through the 11 soil conservation districts in the two-State area.

The author is field information specialist, Soil Conservation Service, Upper Darby, Pa.

Family Farms & Recreation

Most farms in the United States continue to be a family business. Even though farms are getting bigger, U. S. Department of Agriculture figures show that operators and family members are the risk-taking managers doing most of the farmwork.

The report also shows more total sales of farm products coming from farms doing $40,000 or more annual business. Farms with sales between $40,000 and $100,000 more than tripled from 1939 to 1959; and those with marketings of $100,000 or more increased from 5,000 to 20,000 in that period. For all farms, 70 percent of the marketings came from family farms. Hired managers are found principally on farms in the above–$100,000 marketing group, but even of those, only 13 percent had hired managers in 1959.

Meanwhile, more than 51,800 organized church, youth, recreation, and other groups with 8.9 million members lease or have permits to use 39 million acres of privately owned farm and other land for outdoor recreation. Reporting results of a nationwide survey made by the Soil Conservation Service for the early 1964 meeting of the Rural Areas Development Advisory Committee, Secretary Orville L. Freeman said using organizations also include sportsmen, employee associations, ski clubs, and others.

Leases and permits reported involved 47,324 land owners and operators, 27,392 of whom received some kind of income or other economic returns from the using groups. The survey was made in cooperation with 2,940 soil and water conservation districts organized and operated by farmers and ranchers. More than 17,000 rural-urban groups also have received conservation help from the SCS.

The most unusual part of Glenn Brown's job as manager of Josef Meier's conservation ranch is tending the camels used in the Black Hills Passion Play.

Passion Play Director Also Good Soil Steward

By Perry Eberhart

GOOD soil stewardship comes naturally for Josef Meier as leading actor and director of the American version of the "Passion Play" produced on his ranch in the South Dakota Black Hills just north of Spearfish.

The Passion Play was at its height, in western Europe, during the Middle Ages; but in modern times its chief production has been once every 10 years at Oberammergau in the Bavarian Alps. Among earlier forerunners of this dramatic portrayal of Christ's death that sometimes are mentioned were the Abydos Passion Play of Egypt, on the death and resurrection of the deity, Osiris; those celebrating the god, Temmuz (the Greek Adonis), in Syria; and portrayal of the story of Dionysus in Crete.

It was Meier and 10 actors who brought to America from his birthplace of Lunen, Germany, the play they dated back to the year 1242. After years of study and training, Meier advanced to play the leading role—in which he since has given more than 5,000 performances—and to become the play's director. The year after he became a citizen of the United States, in 1938, he established the permanent home for the play in the Black Hills, where a natural amphitheater provided a wide view of terrain that looks much like the

The author is field information specialist, Soil Conservation Service, Denver, Colo.

Rambouillet ewes grazing on the ranch of Josef Meier, director and leading actor in the Black Hills Passion Play near Spearfish, S. Dak.

Holy Land did nearly 2,000 years ago—even to camels Meier keeps for use in the play!

The remoteness of the location made for a few slow years before the fame of the production spread, but today thousands of people from throughout the world come to view the American Passion Play. A second amphitheater, in Florida, was completed in 1952.

When he was certain the play would survive its first years here and become a permanent fixture in the Black Hills, Meier bought a small ranch just outside of Spearfish. He has added to it over the years, and now operates a 1,000-acre farm and ranch which can be seen from the Passion Play amphitheater and owns another 200 acres of ranch and timberland near the theater.

As the Passion Play is presented, three times a week, in Spearfish from June until September, Meier is able to spend much time on the ranch. In winter, when the play is presented in Lake Wales, Fla., and in other months when the company is touring, he maintains close touch with his manager, Glenn Brown. A perfectionist in ranching as he is in acting and in directing the Passion Play, Meier became an early cooperator, in 1946, with the Lawrence County Soil Conservation District; and he has carefully carried out his complete soil and water conservation plan with technical help from the Soil Conservation Service.

All but 120 acres of Meier's main ranch is rangeland. Fifty acres is irrigated and rotated between grass and crops, mostly corn and oats. Another 90 acres is dryland. The 200 acres adjacent to the Playhouse is rangeland, used primarily for horses and timberland, from which he cuts some pulpwood and uses for camping by Scout and church groups and others who come to see the play.

The practices called for in Meier's conservation ranch plan include irrigation land leveling, terracing, crop rotation, use of crop residues, and proper range use. Other conservation measures planned are pasture planting, irrigation structures, grassed waterway, a farm pond for livestock water, deferred grazing of native rangeland, and woodland management.

Meier is a longtime advocate of the conservation rancher's rule of "taking half and leaving half" of the season's volume of grasses. All 850 acres of native pasture is cross-fenced so he can rotate grazing on three pastures. Meier plans to double his 40 cows since conservation has increased the carrying capacity of his range. In addition, Ranch Manager Brown runs about 50 Rambouillet ewes of his own, and there are also horses and burros used in the Passion Play—and the camels, which draw curious tourists. He keeps nine, usually four on the main ranch and the others are in a grazing area adjacent to the Playhouse. Only two ordinarily are taken along for the road shows.

As on his ranch, Meier has applied erosion control measures on the steep slope which the amphitheater occupies above Spearfish. These include concrete turnouts, channels, and other drainage structures to prevent erosion on the hill; terracing along the edge of the theater seats; and grasses, shrubbery, and small trees both here and along the open area separating the audience from the various stages needed in the performance.

Have You Seen?---

● "Community Watershed Planning," by the Soil Conservation Service, USDA Program Aid 528. Small-watershed projects have made flood prevention a reality to millions of rural, suburban, and city people. This booklet shows that the need to protect people, land, and property from flood damages and water shortages is urgent. Watershed planning and resource development bring community improvement and multiple agricultural, municipal, recreation, and wildlife benefits. Ten pages tell about a few of the numerous small-watershed projects finished or under construction in the Northeast.

● "Rural Recreation Enterprises for Profit," USDA's Agriculture Information Bulletin 277. Addressed to private landowners and operators, this bulletin offers suggestions and lists opportunities for using farmland for income-producing recreation, and for small-watershed or other community recreational developments. It also covers legal problems and financing and other business angles.

New Horizons in Conservation

Excerpts From the 1963 Annual Report of the Soil Conservation Service

New programs and new interests challenge the skill and ingenuity of soil conservationists as the Department of Agriculture puts into effect policies set forth by its Land and Water Policy Committee and incorporated in the Food and Agriculture Act of 1962.

New activities stemming from the Act include: (1) Resource Conservation and Development projects, being planned in many areas and approved in 10 as of May 1; (2) a Cropland Conversion Program, now underway in 41 test counties; (3) cost-shared recreation developments in small watershed projects; and (4) financial and technical assistance for rural recreation enterprises on private land.

These and other new responsibilities involve the Soil Conservation Service and soil and water conservation districts with the whole range of land uses for the benefit of all the people. Their work no longer is limited primarily to helping farmers control erosion and improve soil productivity. It extends to solving land and water problems of urban and suburban communities and seeking balanced land use patterns that serve the total public welfare.

The 1963 Annual Report of the Soil Conservation Service reflects the broadened scope of its responsibilities and activities. Fiscal 1963 was the first full year of operation of the revised time and progress reporting systems since they were converted to automatic data processing procedures. The resulting statistical summaries, although somewhat delayed in the first year, permit a much more complete picture of conservation accomplishments on the land than was ever possible before.

This report provides a useful bench mark of progress as we move into broader fields of conservation activity.—D. A. Williams, *Administrator.*

THE extensions of the resource conservation and development activities of the Department and of the Soil Conservation Service show a growing recognition of the fact that *conservation is a community service.* It is of concern and of value to all people, both rural and urban; not limited to helping farmers improve productivity and profits by preventing soil erosion.

"The land and water resources of the United States are vital national assets," said the Land and Water Policy Committee in its report. "How we conserve, develop, and manage these natural resources will affect our economic growth, the strength of our Nation, and our long-run status in world affairs."

The major part of these natural resources are privately owned and operated under the laws of the 50 States. Seventy-one percent of the total land area of the United States mainland and 61 percent of the 50 States is held by private citizens or in trust for Indians. Another 5 percent is owned by States and local governments.

The Department of Agriculture has the major responsibility for cooperative programs with States and local governments to conserve, develop, and manage soil, water, grass, forest, and wildlife habitat on private and other non-Federal lands. This gives the Department a principal role in the total job of resource conservation and development for the national welfare.

Service to Urban Fringe Areas

In response to growing demand from municipal and county officials and citizens' groups concerned with land use planning and soil and water problems in urban and suburban areas, the Soil Conservation Service increased consultive assistance and soil survey work with these groups in fiscal year 1963.

Service to urban and suburban people consisted mainly in providing soil surveys and related information useful in guiding urban expansion and in combating runoff, erosion, and sediment problems in urban fringe areas.

Soil surveys were accelerated in areas of urban development and SCS technicians combined their knowledge and experience with that of specialists in engineering and urban planning to provide local guides for land use and conservation.

SCS has headquartered soil conservationists in a few urban fringe areas to work specifically on nonagricultural land use problems, but most such service is provided by the regular staffs assigned to work through soil conservation districts.

Rural Recreation

The Soil Conservation Service in fiscal 1963 intensified its attention to the improvement and use of outdoor recreation resources on privately owned rural land. It encouraged the establishment of income-producing recreation enterprises that would bring increased income to farm families and provide new recreation opportunities to meet the growing demand from

Progress items	Unit	Accomplished in fiscal year 1963			Cumulative to June 30, 1963
		By use of funds under all SCS programs	By State employees & other agencies	Total reportable progress	
INDIVIDUAL CONSERVATION PLANS AND SERVICES					
District cooperators	No.	114,441	344	114,785	1,979,151
District cooperators	Acres	39,712,935	52,901	39,765,836	634,928,801
Cooperators canceled	No.	68,754	82	68,836	—
Cooperators canceled	Acres	18,143,563	7,980	18,151,543	—
Landowners assisted	No.	1,023,444	18,082	1,041,526	—
Services provided	No.	3,118,048	50,828	3,168,876	—
Owners applying practices	No.	657,914	7,915	665,829	—
Basic plans prepared:					
Farm	No.	97,434	800	98,234	1,403,232
Ranch	No.	4,567	—	4,567	54,589
Other	No.	2,664	1	2,665	14,839
(Total basic plans)		(104,665)	(801)	(105,466)	(1,472,660)
Farm	Acres	20,847,184	143,639	20,990,823	285,284,974
Ranch	Acres	15,900,847	—	15,900,847	167,039,691
Other	Acres	385,886	27	385,913	3,016,364
(Total basic plans)	Acres	(37,133,917)	(143,666)	(37,277,583)	(455,341,029)
Basic plans canceled:					
Farm	No.	44,874	242	45,116	—
Ranch	No.	1,626	—	1,626	—
Other	No.	244	—	244	—
(Total plans canceled)	No.	(46,744)	(242)	(46,986)	—
Farm	Acres	8,032,433	38,718	8,071,151	—
Ranch	Acres	4,831,413	—	4,831,413	—
Other	Acres	136,516	—	136,516	—
(Total plans canceled)	Acres	(13,000,362)	(38,718)	(13,039,080)	—
Basic plans revised:					
Farm	No.	30.350	151	30,501	—
Ranch	No.	2,293	—	2,293	—
Other	No.	87	—	87	—
(Total plans revised)	No.	(32,730)	(151)	(32,881)	—
Farm	Acres	8,490,267	32,771	8,523,038	—
Ranch	Acres	8,888,548	—	8,888,548	—
Other	Acres	34,734	—	34,734	—
(Total plans revised)	Acres	(17,413,549)	(32,771)	(17,446,320)	—
CONSULTIVE SERVICES					
Services provided	No.	61,268	600	61,868	—
OPERATING UNITS					
Total operating units	No.	—	—	—	4,798,097
Total operating units	Acres	—	—	—	1,354,558,970
Other units	No.	—	—	—	1,731,172
GROUP CONSERVATION PLANS AND SERVICES					
Irrigation:					
Group investigations	No.	711	—	711	4,330
Group investigations	Acres	529,671	—	529,671	6,214,124
Group plans prepared	No.	519	—	519	4,014
Group plans prepared	Acres	453,317	—	453,317	5,065,024
Landowners in group	No.	6,595	—	6,595	65,374
Drainage:					
Group investigations	No.	2,230	86	2,316	20,671
Group investigations	Acres	893,913	7,901	901,814	14,915,429
Group plans prepared	No.	1,753	61	1,814	22,643
Group plans prepared	Acres	539,556	4,736	544,292	14,398,472
Landowners in group	No.	7,683	132	7,815	123,209
Erosion control:					
Group investigations	No.	157	9	166	1,134
Group investigations	Acres	155,712	871	156,583	2,250,192
Group plans prepared	No.	116	5	121	950
Group plans prepared	Acres	68,633	789	69,422	1,395,121
Landowners in group	No.	491	16	507	13,325

city people.

In its regular assistance to land owners and operators in soil conservation districts, SCS has always helped cooperators use their land and water in ways that increase fish and wildlife and create pleasant surroundings for outdoor recreation. More than a million farm ponds and lakes, and many other conservation practices that contribute to the interest and beauty of the rural landscape, already are being used by farmers and ranchers as a basis for income-producing recreation enterprises. Small watershed projects also have produced an unforeseen harvest of water-based recreation on the small lakes created by floodwater-retarding structures.

Following enactment of the Food and Agriculture Act of 1962, Secretary's Memorandum No. 1516 in November 1962 assigned to the Soil Conservation Service leadership for the Department's activities in developing outdoor recreation on non-Federal rural land.

During the year SCS participated with other agencies of the Department and provided liaison with Federal, State, and local groups in developing policies and procedures for the Department's stepped-up program of outdoor recreation development. SCS carried on an intensive training program for its own field personnel and assisted with workshops for Farmers Home Administration personnel dealing with income-producing recreation enterprises.

A survey of recreation activities by field units of the Service revealed that more than 9,800 land owners and operators cooperating with soil conservation districts established one or more income-producing recreation enterprises in fiscal 1963, and another 9,000 plan to install such enterprises. Some 945 operators have adopted recreation as the primary source of income on 237,000 acres, and at least an equal number plan to make such a change in land use. In the course of their work, SCS field men discussed recreation as possible land use with more than 39,000 district cooperators.

Rural Areas Development

Soil and water conservation programs from the beginning have contributed directly to the Rural Areas Development objective of the Department—better living for rural people, both farm and nonfarm. Since natural resources form the physical basis of any economic development, the land use adjustments and conservation measures accomplished in the past 30 years through soil conservation districts and small watershed projects amount to a major development in many communities.

The Soil Conservation Service in fiscal 1963 further reoriented its efforts to help rural areas expand employment and income opportunities through resource conservation and development.

SCS provided technical assistance to 2,008 county and area Rural Areas Development Committees and to 2,785 Technical Panels working on local programs of economic development. This help included providing soil surveys, land inventory and capability interpretations, and guidance on site locations for project construction, public facilities, recreation developments, and the like. By June 30, these groups had produced more than 600 Overall Economic Development Programs including land use adjustment and resource conservation.

Resource Conservation and Development Projects

The first Resource Conservation and Development project was approved by the Secretary of Agriculture in May 1963. On-the-ground planning and operations were deferred pending the first appropriation for this new program in fiscal 1964.

Secretary's Memorandum No. 1515, in November 1962, directed agencies of the Department to cooperate in extending assistance to local sponsors in planning and carrying out comprehensive programs of land conservation and land utilization in areas of several adjoining counties or watersheds.

These projects are intended to speed up conservation activities where they may be expected to provide additional economic opportunities to local people.

By June 30, 1963, the Department had received 16 applications for assistance covering 22 million acres. The first approved project, in the Lincoln Hills area of southern Indiana, includes slightly more than a million acres in 4 counties. It is planned to provide water development, recreation and tourist development, industrial development, land use adjustments, and improved marketing and use of agricultural and forestry resources of the area.

Inventory of Conservation Needs

Results of a National Inventory of Soil and Water Conservation Needs were published in August 1962 as USDA Statistical Bulletin 317, *Basic Statistics of the National Inventory of Soil and Water Conservation Needs.*

An interpretive report of the Inventory is in press and a brief digest is available in Agriculture Information Bulletin 263, *Agricultural Resources: Capabilities, Uses, Conservation Needs.*

Conservation Needs Inventory data have already been used by the Department in many ways in operational planning, in developing new programs, and in regional investigations, river basin surveys, and research.

Progress in Soil Conservation Districts

Soil conservation districts continue to be the predominant means of getting soil and water conservation work applied to the land, despite the broadening range of activities and programs in which

Progress items	Unit	Accomplished in fiscal year 1963			Cumulative to June 30, 1963
		By use of funds under all SCS programs	By State employees & other agencies	Total reportable progress	
GROUP CONSERVATION PLANS AND SERVICES (Continued)					
Flood prevention:					
Group investigations	No.	34	—	34	114
Group investigations	Acres	215,566	—	215,566	3,188,160
Group plans prepared	No.	19	—	19	28
Group plans prepared	Acres	74,548	—	74,548	2,109,027
Landowners in group	No.	158	—	158	593
Total group services	No.	40,872	803	41,675	—
GREAT PLAINS CONSERVATION PROGRAM					
Applications received	No.	3,885	—	3,885	16,503
Applications received	Acres	6,145,655	—	6,145,655	37,184,653
Contracts signed	No.	2,852	—	2,852	12,393
Contracts signed	Acres	5,051,330	—	5,051,330	28,438,161
Contract modifications	No.	10,551	—	10,551	37,197
Contracts terminated:					
By mutual consent	No.	38	—	38	215
By mutual consent	Acres	52,749	—	52,749	565,790
For cause	No.	55	—	55	232
For cause	Acres	70,987	—	70,987	212,996
By expiration	No.	989	—	989	1,504
By expiration	Acres	1,418,681	—	1,418,681	2,293,088
(Total terminations)	No.	(1,082)	—	(1,082)	(1,951)
(Total terminations)	Acres	(1,542,417)	—	(1,542,417)	(3,071,874)
Cropland before GP contract	Acres	753,857	—	753,857	3,741,235
Planned cropland conversion	Acres	191,826	—	191,826	861,303
AGRICULTURAL CONSERVATION PROGRAM					
Referrals received F.Y. 1963	No.	362,143	398	362,541	—
Referrals received P.Y. 1962	No.	—	—	—	387,594
Referrals serviced F.Y. 1963	No.	350,488	5,659	356,147	—
Referrals serviced P.Y. 1962	No.	—	—	—	372,519
CROPLAND CONVERSION PROGRAM					
Forms ASCS-312 received	No.	3,733	—	3,733	—
Assistance completed	No.	3,670	—	3,670	—
CCP referrals received	No.	446	—	446	—
CCP referrals serviced	No.	76	3	79	—
SOIL SURVEYS					
Standard soil surveys:					
High intensity mapping	Acres	1,679,986	170,704	1,850,690	19,629,475
Medium intensity mapping	Acres	27,687,492	3,628,510	31,316,002	393,061,126
Low intensity mapping	Acres	12,151,236	1,127,217	13,278,453	48,589,291
(Total mapping)	Acres	(41,518,714)	(4,926,431)	(46,445,145)	(461,279,892)
High intensity conversions	Acres	868,065	—	868,065	—
Medium intensity conversions	Acres	16,174,562	294,574	16,469,136	—
Low intensity conversions	Acres	657,664	—	657,664	—
(Total conversions)	Acres	(17,700,291)	(294,574)	(17,994,865)	—
Reconnaissance mapping	Acres	1,331,560	6,120	1,337,680	12,898,759
Reconnaissance conversions	Acres	323,590	—	323,590	—
Soil conservation surveys	Acres	3,862,828	21,315	3,884,143	323,955,120
Soil conservation surveys canceled or converted	Acres	23,622,860	191,773	23,814,633	—
Supplemental soil surveys	Acres	918,119	17,503	935,622	—
SNOW SURVEYS & WATER SUPPLY FORECASTING					
Snow course measurements	No.	3,183	436	3,619	—
Aerial snow marker readings	No.	394	55	449	—
Precipitation gage readings	No.	918	121	1,039	—
Soil moisture readings	No.	1,175	152	1,327	—
River stations for which numerical forecasts issued	No.	812	—	812	—
Numerical forecasts issued	No.	1,796	—	1,796	—

the Soil Conservation Service participates.

In fiscal 1963, 93 percent of the land owners and operators assisted by SCS activities were served as cooperators of soil conservation districts. The remainder received assistance through watershed protection, Great Plains Conservation, or other programs administered or assisted by SCS. Eighty-eight percent of soil surveys were made in soil conservation district operations.

The Soil Conservation Service assisted more than 1 million land owners and operators, of which 665,829 applied one or more conservation practices. Assistance was provided to 964,166 individuals through districts, to 53,499 through watershed projects, 5,779 through the Great Plains Conservation Program, and 18,082 through employees of States or other agencies assisting districts.

Soil conservation districts also are providing increasing leadership for the growing programs of rural areas development, rural recreation, land use planning in urban fringe areas, and other new aspects of resource conservation and development.

Organization of Districts

At the close of fiscal 1963, the Soil Conservation Service was assisting 2,942 conservation districts in the 50 States, Puerto Rico, and the Virgin Islands.

Twenty-eight new districts were formed during the year, and 15 existing districts were discontinued as a result of consolidation, subdivision, or other changes in territory. The net increase of 13 in number of districts resulted in an increase of 13.1 million acres in area to bring the total to 1,718.9 million acres.

These districts contain 97 percent of the farms and ranches, and 93 percent of the land in farms, in the United States. Twenty-four States and the 2 Caribbean territories are completely covered by districts.

Conservation Planning

Soil conservation districts added 114,785 new cooperators in fiscal 1963, bringing 39,765,836 acres under agreement to be planned for conservation treatment. As of June 30, districts had 1,979,151 cooperators operating 634,928,801 acres.

District cooperators prepared 105,466 basic conservation plans on 37,277,583 acres with SCS technical assistance and revised 32,881 plans on 17,446,320 acres. At the end of the year, 1,403,232 district cooperators had basic plans on 455,341,029 acres.

In addition to individual farm and ranch conservation plans, SCS helped prepare 2,473 group plans involving adjoining landowners who agreed to cooperate in doing conservation work that affected their land.

Conservation Applied to the Land

Cooperators in soil conservation districts continued in fiscal 1963 to make good progress in getting conservation practices applied to the land in accordance with their conservation plans. Special programs in certain localities, such as watershed projects and the Great Plains Conservation Program, accelerated the work through cost-sharing or additional technical assistance. Most land treatment was done, however, by individual landowners using technical assistance provided by the Soil Conservation Service through the districts. Many cooperators also received cost-sharing from the Agricultural Conservation Program.

Planting of grass and trees and the use of conservation cropping systems were prominent among practices of widespread application in fiscal 1963. A total of 120 individual practices, some of restricted application, were reported as established under all programs providing assistance.

Assistance to ACP Cost-Sharing

The Soil Conservation Service continued to provide onsite technical services for permanent type practices in the Agricultural Conservation Program of cost-sharing for soil, water, and wildlife conservation practices.

The Soil Conservation Service received 387,594 and serviced 372,519 ACP referrals for the program year 1962, which was completed during the fiscal year 1963.

Watershed Protection and Flood Prevention (Public Law 566)

The Soil Conservation Service received 234 applications for assistance on small watershed projects under the Watershed Protection and Flood Prevention Act (Public Law 566, as amended) in fiscal year 1963—a 19 percent increase over 1962 and the fourth year of an upward trend. By the end of the year, 48 States and Puerto Rico had submitted a total of 1,936 applications for Federal assistance.

A total of 121 watersheds were authorized for planning, a record number for any one year. To date, 46 percent of the applications received, or a total of 890, have been approved for planning.

Eighty-eight projects were approved for operations during fiscal year 1963, the largest number in any year since the program was initiated. A total of 473 projects have now been approved for Federal assistance in the installation of works of improvement. This approval assures Federal help for technical assistance to plan and install land treatment measures and make the engineering surveys and designs required in advance of construction. Initial agreements for construction were signed in 78 projects located in 34 States.

Structural measures installed in fiscal 1963 with watershed protection (Public Law 566) funds included 235 floodwater-retarding structures and 302 miles of stream

Progress items	Unit	Accomplished in fiscal year 1963			On the land June 30, 1963
		By use of funds under all SCS programs	By State employees & other agencies [1]	Total reportable progress	
CONSERVATION PRACTICES APPLIED					
Bedding	Acres	26,032	1,315	27,347	356,988
Brush and weed control	Acres	3,717,830	14,626	3,732,456	26,818,374
Irrigation canal or lateral	Miles	450	88	538	31,806
Cattle walkway	Miles	18	—	18	225
Chiseling	Acres	383,781	244	384,025	2,234,007
Clearing and snagging	Miles	178	—	178	1,208
Conservation cropping system	Acres	22,797,057	112,010	22,909,067	131,704,734
Contour farming	Acres	6,054,495	50,107	6,104,602	39,204,454
Contour furrowing	Acres	42,529	7	42,536	564,150
Contouring orchard, etc.	Acres	9,690	283	9,973	332,064
Controlled burning	Acres	364,676	10	364,686	—
Cover and green manure crop	Acres	4,948,501	36,274	4,984,775	—
Critical area planting	Acres	48,314	19,799	68,113	1,134,189
Cut-back border	Feet	419,015	6,840	425,855	11,480,706
Dam, diversion	No.	901	2	903	—
Dam, multiple-purpose	No.	210	3	213	5,438
Debris basin	No.	3,715	38	3,753	79,159
Range deferred grazing	Acres	17,108,736	4,822	17,113,558	48,539,389
Desilting area	Acres	944	1	945	2,687
Dikes and levees	Miles	282	15	297	7,112
Irrigation ditch & canal lining	Miles	1,619	29	1,648	15,688
Ditchbank seeding	Miles	1,232	32	1,264	14,094
Diversions	Miles	3,242	68	3,310	82,458
Dune stabilization	Acres	1,695	2	1,697	64,498
Emergency tillage	Acres	300,471	—	300,471	—
Farm pond	No.	52,185	1,701	53,886	1,263,472
Farmstead windbreak	Acres	19,442	2,371	21,813	924,631
Field border planting	Miles	1,167	77	1,244	36,520
Irrigation field ditch	Miles	3,570	529	4,099	108,147
Firebreaks	Miles	12,801	198	12,999	115,238
Fish and crop rotation	Acres	13,324	—	13,324	19,358
Fishpond stocking	No.	35,816	535	36,351	619,180
Floodwater diversions	Feet	51,202	1,000	52,202	913,747
Floodway	Miles	22	1	23	392
Grade stabilization structure	No.	7,344	174	7,518	103,251
Grass in rotation	Acres	1,303,469	21,940	1,325,409	—
Grass waterway or outlet	Acres	122,426	2,544	124,970	1,876,512
Hayland planting	Acres	349,639	8,509	358,148	4,028,554
Hedgerow planting	Miles	566	82	648	26,443
Hillside ditch	Miles	426	104	530	8,766
Irrigation pipeline	Miles	3,188	119	3,307	34,226
Irrigation storage reservoir	No.	1,570	43	1,613	32,860
Irrigation system, sprinkler	No.	3,262	100	3,362	72,482
Irrigation system, surface and subsurface	No.	4,576	141	4,717	83,257
Irrigation system, tailwater recovery	No.	1,869	46	1,915	5,112
Irrigation water management	Acres	2,404,180	4,370	2,408,550	8,600,236
Drainage land grading	Acres	34,021	2,028	36,049	120,595
Irrigation land leveling	Acres	473,550	37,575	511,125	7,587,890
Land smoothing	Acres	339,513	2,980	342,493	3,482,440
Livestock exclusion	Acres	732,041	4,718	736,759	14,045,887
Minimum tillage	Acres	801,072	5,479	806,551	3,769,831
Drainage main or lateral	Miles	8,559	524	9,083	264,602
Mole drain	Miles	281	17	298	1,156
Mulching	Acres	25,271	28	25,299	249,854
Mulch planting	Acres	39,941	—	39,941	131,922
Woodland natural seeding	Acres	89,196	406	89,602	2,235,926
Obstruction removal	Acres	21,419	204	21,623	545,441
Pasture hayland renovation	Acres	1,346,595	19,192	1,365,787	14,591,500
Pasture planting	Acres	2,142,269	37,410	2,179,679	38,093,756
Pipeline for stockwater	Miles	1,189	56	1,245	9,178
Pitting	Acres	10,701	—	10,701	145,074
Pond sealing or lining	No.	583	2	585	6,066
Pasture proper use	Acres	6,609,980	25,386	6,635,366	23,506,546
Range proper use	Acres	64,657,545	15,148	64,672,693	175,723,940
Woodland proper grazing	Acres	1,232,311	359	1,232,670	7,642,008
Pumped well drain	No.	4	—	4	140
Pumping plant, water control	No.	2,041	79	2,120	29,855
Range renovation	Acres	81,245	—	81,245	1,731,478
Range seeding, converted land	Acres	156,517	204	156,721	3,538,413

channel improvement. The works of improvement installed in these watersheds since the first projects were authorized in 1956 include 1,115 floodwater-retarding structures and almost 1,000 miles of stream channel improvement.

Local sponsoring organizations have acquired more than 14,500 land easements and rights-of-way valued at about $17 million. They have also signed maintenance agreements providing for annual inspection and maintenance of all completed structural measures.

All land treatment and structural measures have been completed in 55 projects located in 27 States. Eleven projects were completed in fiscal year 1963. Structural measures have been completed in 40 additional projects which will remain in an active status to complete land treatment or minor structural work such as seeding of dams. A total of 37 States now have one or more projects with all structural measures complete.

Pilot Watershed Protection Projects

Fiscal 1963 was the 10th year since the 62 pilot watershed protection projects were started in cooperation with local sponsors. Eight were later discontinued at the request of sponsors, leaving 54 to be completed. By June 30, all works of improvement had been installed on 45 projects. Four more are scheduled for completion in 1964, 2 in 1965, and 3 will continue in operation after 1965.

Flood Prevention in Authorized Watersheds

Work plans were prepared in fiscal 1963 for 11 subwatersheds covering about 874,000 acres in the 11 large watersheds authorized for flood prevention work. To date 225 work plans have been prepared for 18,570,000 acres or 60 percent of the total authorized areas.

The works of improvement installed in these watersheds in fiscal 1963 include 206 floodwater-retarding structures and 44 miles of channel improvement, bringing the totals to date for these items to more than 1,450 floodwater-retarding structures and 464 miles of channel improvement.

River Basin Surveys

The Soil Conservation Service participated with other Federal and State agencies in surveys of 25 major river basins in fiscal year 1963, under provisions of Section 6 of Public Law 566, as amended. These surveys aim to develop comprehensive plans for the coordinated and orderly development, management, and use of the water and related land resources of the basins, or are concerned with special water problems in certain river basins.

SCS has been assigned overall responsibility for the Department of Agriculture's participation in these activities and heads advisory committees in Washington and at field locations to coordinate the participation of USDA agencies. The SCS, Forest Service, and Economic Research Service are taking part in the surveys and are represented on the committees.

Great Plains Conservation Program

In the 383 counties designated for the Great Plains Conservation Program, the Soil Conservation Service in fiscal 1963 assisted 2,852 farmers and ranchers prepare complete land use and conservation plans on 5,051,330 acres as a basis for new cost-sharing contracts with the Department of Agriculture.

New contracts in 1963 brought the total under the program to 12,393 covering 28,438,161 acres. At the end of the year more than 4,000 applications were pending. Since the program started in 1957, planned work had been completed on 2,293,088 acres under 1,504 contracts.

Conversion of low-grade cropland to permanent vegetation mainly grass, is the major feature of the Great Plains Conservation Program. Contracts to date provide for conversion of 861,303 acres of cropland, or 23 percent of that in the farms and ranches before planning.

Soil Surveys

Field mapping was completed during the 1963 fiscal year on 68,324,153 acres of detailed soil surveys and 1,661,270 acres of reconnaissance surveys, making a total of 69,985,423 acres. This includes 5,221,005 acres mapped by cooperating agencies participating in the National Cooperative Soil Survey.

The 1963 accomplishment compares to 65,040,992 acres of detailed mapping and 3,632,110 acres of reconnaissance mapping in 1962, making a total of 68,673,102 acres. The added emphasis on detailed mapping more than offset the reduction in reconnaissance surveys and resulted in a net increase of 1,312,321 acres in total area mapped in 1963. Mapping by other agencies increased 1,988,896 acres from the 1962 level of 3,259,544 acres.

As of June 30, 1963, more than 785 million acres had been mapped in detail for use in conservation planning of farms, ranches, watersheds, and for other uses. This is about 35 percent of the total land area of the United States and 75 percent of the land in farms in soil conservation districts. It is about 41 percent of the area on which detailed surveys are needed.

In addition, about 13 million acres are covered by reconnaissance surveys, providing soil information of some intensity on at least 798 million acres.

The use of soil surveys by both public and private agencies and by individuals is increasing steadily. More attention is being given to presenting and explaining new published soil surveys to users and potential users.

A large group of nonagricultur-

Progress items	Unit	Accomplished in fiscal year 1963			On the land June 30, 1963
		By use of funds under all SCS programs	By State employees & other agencies [1]	Total reportable progress	
CONSERVATION PRACTICES APPLIED (Continued)					
Range seeding	Acres	355,084	1,945	357,029	7,490,397
(Total range seeding)	Acres	(511,601)	(2,149)	(513,750)	(11,028,810)
Irrigation pit or regulating reservoir	No.	2,401	24	2,425	31,077
Regulating drainage water	Acres	61,037	247	61,284	643,079
Rock barrier	Feet	20,753	293	21,046	373,652
Rotation-deferred grazing	Acres	2,951,383	1,455	2,952,838	8,892,505
Row arrangement	Acres	180,688	23	180,711	1,399,915
Rotation grazing	Acres	2,946,094	19,878	2,965,972	10,955,443
Spoilbank spreading	Miles	5,531	169	5,700	104,778
Spring development	No.	3,845	64	3,909	71,029
Stock trail	Miles	206	—	206	2,530
Streambank protection	Miles	186	1	187	3,320
Stream channel improvement	Miles	752	4	756	7,216
Stream channel stabilization	Feet	110,387	—	110,387	2,405,738
Stripcropping, contour	Acres	208,630	6,905	215,535	4,866,335
Stripcropping, field	Acres	135,829	300	136,129	3,305,588
Stripcropping,wind	Acres	312,426	3,215	315,641	10,872,486
(Total stripcropping)	Acres	(656,885)	(10,420)	(667,305)	(19,044,409)
Structures, water control	No.	83,070	2,400	85,470	1,264,328
Stubble mulching	Acres	3,083,769	896	3,084,665	16,968,527
Subsoiling	Acres	422,553	37	422,590	185,187
Drainage field ditch	Miles	7,673	216	7,889	132,390
Terrace, basin	Miles	91	8	99	853
Terrace, gradient	Miles	21,150	308	21,458	862,784
Terrace, level	Miles	15,008	211	15,219	322,921
Terrace, parallel	Miles	3,709	72	3,781	26,645
(Total terraces)	Miles	(39,958)	(599)	(40,557)	(1,213,203)
Tile drain	Miles	27,599	1,526	29,125	555,474
Tile system structure	No.	9,780	462	10,242	122,672
Toxic salt reduction	Acres	66,344	6,018	72,362	808,985
Tree planting	Acres	334,512	18,807	353,319	9,792,444
Trough or tank	No.	8,767	524	9,291	234,760
Vegetative barrier	Miles	292	100	392	5,214
Vertical drain	No.	45	—	45	1,295
Waterspreading	Acres	35,709	101	35,810	772,027
Well	No.	5,297	682	5,979	268,933
Wildlife habitat preservation	Acres	696,004	35,657	731,661	5,892,491
Wildlife wetland development	Acres	66,820	2,053	68,873	640,656
Wildlife habitat development	Acres	145,802	5,582	151,384	2,378,766
Wildlife wetland preservation	Acres	116,278	10,708	126,986	891,216
Wildlife watering facility	No.	216	3	219	3,808
Woodland direct seeding	Acres	23,541	7,616	31,157	256,565
Woodland harvest cutting	Acres	791,504	8,719	800,223	11,396,167
Woodland intermediate cutting	Acres	822,909	5,149	828,058	11,483,069
Woodland interplanting	Acres	27,778	376	28,154	608,953
Woodland pruning	Acres	14,805	2,145	16,950	277,974
Woodland thinning	Acres	60,875	2,211	63,086	1,520,387
Woodland underplanting	Acres	29,506	513	30,019	571,622
Woodland weeding	Acres	448,452	12,442	460,894	7,664,598
LAND USE CONVERSIONS [2]					
Cropland to grassland	Acres	—	—	—	4,783,033
Cropland to woodland	Acres	—	—	—	560,184
Cropland to wildlife—recreation	Acres	—	—	—	193,113
Cropland to "other"	Acres	—	—	—	1,168,395
All other uses to cropland	Acres	—	—	—	1,223,147
All other uses (except cropland) to wildlife-recreation	Acres	—	—	—	717,310

[1] Includes certain practices on the lands of new SCD cooperators applied without SCS assistance.

[2] Conversions on the land June 30, 1963, are estimates of conversions since July 1, 1962.

ists—State, city, and town planning groups, and others—have become interested in the use of soil surveys in urban-fringe areas. Cost-sharing by local groups, up to about one-half the cost of the soil mapping, is becoming common.

The SCS participated in soil surveys in 20 urban fringe areas under formal cost-sharing agreements with cities and towns in fiscal 1963, and made surveys in at least 50 others, mapping approximately 1 million acres for immediate use in urban planning.

Land Today Has New Values

THE advances in resource development over the past 2 years are notable because they have occurred in so short a space of time. To me, this is a most encouraging sign that we are beginning to better understand the causes of change in rural America, and to mold change to the advantage of people. . . .

Many rural communities have discovered new economic opportunities by growing livestock and timber on land that had been producing crops already in surplus. Soil and water conservation districts have long provided leadership in this field, for shifting land to uses for which it is better suited has always been a basic part of your program. Cooperators in your nearly 3,000 districts are converting about 2.5 million acres of cropland to less intensive uses each year. This land is not being idled. Rather it is being converted to a use for which the soils are better suited—the production of grass and timber and to wildlife and recreation uses.

More than one-fourth of the cropland going permanently to grass is located in the Great Plains where the Great Plains Conservation Program has helped to speed up this process. To date, nearly 14,000 long-term cost-sharing contracts will convert 1 million acres to grass, or 23 percent of the cropland on these farms and ranches.

Finally, even more concentrated efforts toward land conversion and resource development will be planned in the new Resource Conservation and Development projects, also authorized by the Food and Agriculture Act of 1962. We have received applications for assistance from local sponsors of about 20 of these proposed projects covering about 30 million acres in 15 States.

RC&D projects are a new approach to assisting rural communities. They are intended to carry out a program of land conservation and land utilization in an area where acceleration of current conservation activities, plus the use of new authorities, will provide additional income and job opportunities to its people. . . .

Secretary of Agriculture Orville L. Freeman.

The job of soil conservation districts has changed greatly since the first one was organized nearly 27 years ago. The greatest changes have come in the past few years. Once you worked almost solely with the individual farmer and rancher, helping him plan and install a conservation program tailored to his land and his needs. That is still a big part of your job, and it will remain so. In the past quarter century, you have built an unchallenged reputation of leadership in soil and water conservation and agricultural land use.

Your challenge today, however, is to move boldly into community-wide resource development action, providing the one element that will make Rural Areas Development really work: local initiative and local coordination and direction. I urge you to be in the lead in RAD activities in your home community, for RAD is on the move and it will continue to gain momentum.

The dimensions of the resource job we face are staggering. Land today has new values beyond the production of food and fiber. It is looked upon as a source of community stability and economic growth, as the development base for new jobs, for recreational opportunities, for living and working space and other benefits that relate to nonfarm as well as to farm and ranch people.

As you know, a major objective of USDA programs in the past 3 years has been to help improve farm income, to broaden the income base for farmers and ranchers, and to help them shift land that is either unsuited or unneeded for cultivation away from the production of surplus crops.

The Department's land and water conservation efforts which contribute to this are decentralized. They are controlled and managed at the local level by local people—responsible local citizens like the officers of soil and water conservation districts. These are not Federal programs. They are local programs with Federal assistance. We want them to remain that way.

The progress of the past 2 years reflects the wisdom of this approach . . . and the promise of the future depends on how well you and other leaders move ahead to the job at hand.

—Excerpts from address by Secretary of Agriculture Orville L. Freeman before the National Association of Soil and Water Conservation Districts, Kansas City, Mo., Feb. 4, 1964.

Girl Scout Cookies Help Build "Sweetest Lake in the World"

By J. R. Sasser

THE locally known "Sweetest Lake in the World" in southeastern Tennessee just above the Mississippi line was built in major part with cookies—300,000 boxes of Girl Scout cookies to be exact.

Turning the first spadeful of soil for the multiple purpose lake. L. to r.: Kate Kephart; Edward F. Thompson, president of the Tenn-Ark-Miss Council of Girl Scouts; J. A. "Happy" Craft, contracting officer, Porters Creek Watershed District; and Denise Lowery.

The 70-acre multiple-purpose reservoir, near Middleton, was built cooperatively by the Porters Creek Watershed District and the Tennessee - Arkansas - Mississippi Council of Girl Scouts. The finished dam cost $88,938.63, of which $49,781.42 was borne by the young "soil stewardesses." The Federal share of the job was paid from accelerated public works funds made available because Hardeman County, in which the project is situated, was designated for aid by the Area Redevelopment Administration. Federal technical and financial aid was made available by the Soil Conservation Service through the Watershed Protection and Flood Prevention Act (Public Law 566), with construction contracts administered by the Porters Creek Watershed District.

After dedication of the structure this spring, the cost-sharing Girl Scout Council planned immediately the start of work developing 4 separate camps around the lake, each serving 120 to 150 girls at a time.

"We do not think in terms of dollars, but cookies," Miss Virginia Jones, executive director of the Memphis-based Council, said. "The Girl Scouts receive money for developing camps from the sale of Girl Scout cookies. So we say our share of the lake cost 300,000 boxes of cookies, not $49,781.42."

The dam originally was one of a network of 14 single-purpose flood prevention dams planned to reduce Porters Creek's damaging floods. The site was partly on a 1,150-acre tract owned by the Girl Scout Council, which already had planned a lake there before it knew about the flood detention dam. An agreement was reached between the local sponsors and the Council to share the cost of enlarging the reservoir for multiple-purpose use, including swimming, boating, fishing, and other recreational activities.

Virginia Jones, Executive Secretary of the Tenn-Ark-Miss Council of Girl Scouts.

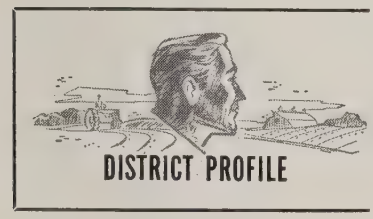
The Porters Creek project is sponsored by the Hardeman County Soil Conservation District and the Porters Creek Watershed District. A small portion extending into Benton and Tippah counties in Mississippi is sponsored by the Northeast Mississippi Soil Conservation District and the Porters Creek Drainage District.

Work was started on the "dam that cookies built" in May 1963 and completed in September, about 4 months ahead of schedule.

The author is State conservationist, Soil Conservation Service, Nashville, Tenn.

"We are delighted that this major step in our watershed has been completed, and we think it will mean much to the Girl Scouts, and much to us," Watershed District President Jim Lenoir of Bolivar said. "The dam will go a long way, of course, toward reducing flood damage; and we hope that erosion, flooded crops, and impassable roads will soon be a thing of the past here."

The dam will capture 289-acre-feet of potential floodwater, and then release it slowly at a controlled rate. When all works of improvement in the Porters Creek project are completed, flood damage will be reduced by an estimated 69 percent. "Sweetest Lake" is the third dam to be completed in the project, and two more are slated for completion in 1964.



People's Souls and Soils—

Both Concern Georgia Minister

PEOPLE—their souls and soils are the main concern of the Rev. Curtis Tillman as pastor of four Georgia churches on the Methodist rural charge in and near Pearson and as chaplain of the Satilla Soil and Water Conservation District.

"How folks treat their souls and their soils are parallel," Tillman will tell you. "I've noticed that the people who protect and wisely use the natural resources given to them by God also usually have deep religious convictions and meet their moral obligations."

Tillman has been one of the leading ministers in Georgia who have for 4 years been boosting the State's natural resources by serving as chaplains of soil and water conservation districts. The theme this year of "Soil Stewardship Week," which districts throughout the Nation observe May 3-10, is particularly appropriate: "To Each Among Us—A Share."

"Go into any community," Tillman says. "Look at their churches and church grounds. If you see pretty buildings and well kept grounds, you'll most probably also see nearby cultivated fields, green pastures and pines, modern schools, attractive homes—in fact, a prosperous community. And you'll also find friendly, contented people."

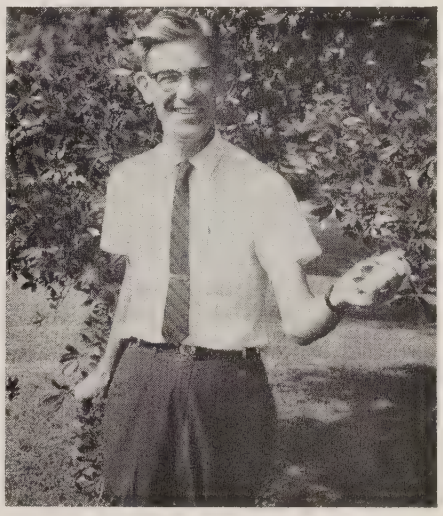
He describes Cook County, where he is now living, as an example of this type of country: "It's one of the cleanest counties I know—morally and physically."

Born and reared on an Appling County farm, Tillman farmed for several years after finishing high school at Surrency. Denied the opportunity of going to college, he has continued his education by completing several correspondence courses, reading, and being a good listener and keen observer.

He has been a public school teacher, a Scoutmaster, youth leader, and a sparkplug of community activities. He is the author of a book of devotions, poems, and prayers, entitled, "I Know a Place," and over the years has written columns and articles on religious and conservation topics for weekly and daily newspapers.

He delivers four sermons every Sunday, and conducts other services at his rural churches at Pearson, Kirkland, Axson, and Sweetwater.

He was named "Rural Minister of the Year" in Georgia in 1962 by the *Progressive Farmer* magazine, while he was pastor of the Lenox-Antioch Methodist Charge at Lenox and chaplain of the Alapaha Soil and Water Conservation District. While he was minister of the Hebardville-Jamestown Methodist Charge near Waycross, he was chosen as "Rural Charge of the Year" in the Waycross district.



Rev. Curtis Tillman is chaplain of the Satilla Soil and Water Conservation District, Georgia.

Tillman, who has a full home life with his wife and five children, mingles with the people of his community and even helps them with their farm chores. He talks their language—and the language of the conservationist.

—Walter S. Allen

DELAWARE BEACH OWNER STOPS WAVES' DAMAGES

By Gordon S. Smith

SAM Houston Showell of Delaware has effectively stilled once damaging waves along a 1,400-foot beach near Millsboro on Indian River Bay back a short way from the Atlantic Ocean. He performed this feat by sloping a high bank that was cutting rapidly toward his beach cottages and by planting the beach to grasses able to stand up against even high storm tidewater.

A 2,000-acre grant from the English Crown enticed Showell's forebearers to this fertile lowland in 1677. The Showells were good stewards of their soil, and the 320-acre "White House Farm" Sam Showell took over in his turn provided a good living for generations. It did, that is, until a declining broiler business and small profits from row crops led the Showells to decide to develop their overall 1¼-mile waterfront as a recreation area.

Starting in 1947, Showell and his three grown sons built, a few each year, eight family-size cabins on the shady shoreline. Their well-managed farm woodlot provided the pine lumber for the buildings. They also converted a broiler house into four more family-size units and, farther down the beach, built a marina for fishing and boating enthusiasts. They converted an old pasture into a grass runway and parking area for flying vacationers.

But the troublesome beach erosion problem threatened the Showells' promising recreation project. Caused by wind and wave, it spread along the quarter-mile-long beach and was heading for the cottages at a rate of 2 feet a year. Something had to be done or the new buildings would be dumped into the bay in a few years.

"The high bank there was the problem," Showell recalls. "It needed to be sloped and protected with grass like any eroding farmland. Family records show that in 1828 our beach front was 240 feet farther out in the bay. I can remember when it was several yards from where it is today."

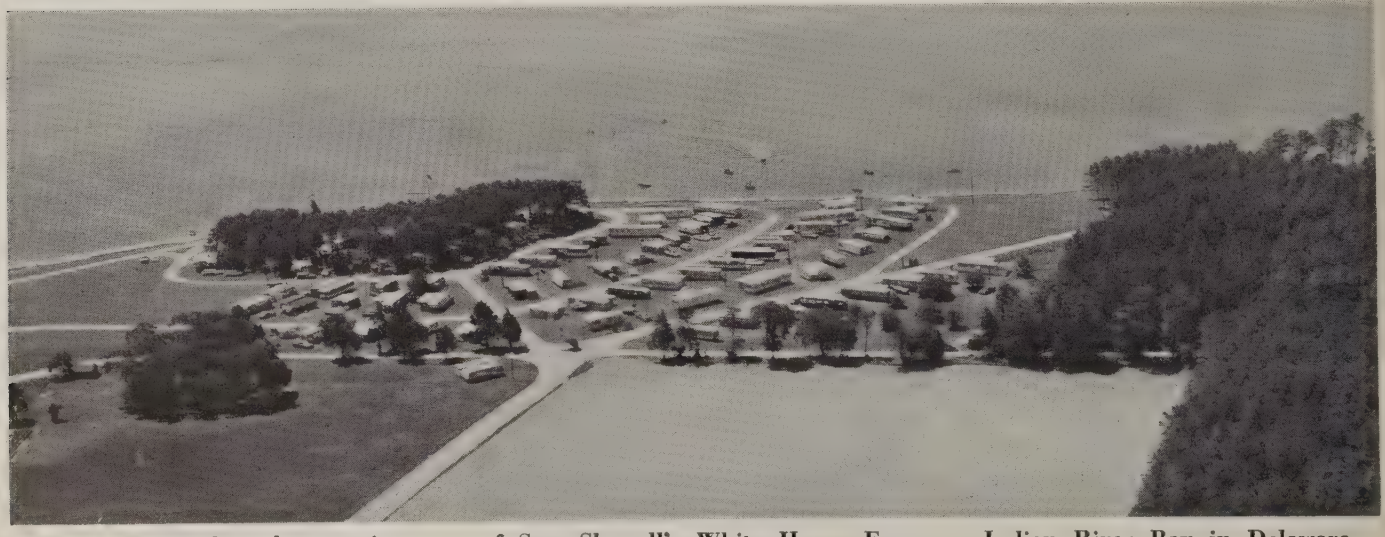
Using their own equipment, the Showells' bulldozed the 10-foot high bank into a gentle, 3:1 slope stretching 50 feet from tree line to waterline. Fallen trees and stumps had to be cleared away, but tall pines still standing were left to provide a 15-foot shady area in front of the cottages. Four thousand cubic yards of fill left over from the beach project was used to build up a low area near the marina.

Having been a cooperator with the Sussex Soil Conservation District for several years, Showell turned to the district and the assisting Soil Conservation Service for technical advice on the final grading and grass planting for the new beach.

Showell planted two lines of saltmeadow cordgrass clones along the high tide line, where it formed a tight cover for the sand and stopped cutting action of waves at the toe of the slope. Next came four lines of American beachgrass clones, a tough perennial that spreads rapidly even in low-fertility, sandy soil. Beachgrass grows up to 2 feet tall and helps slow down waves.

Showell then sprigged Midland bermudagrass on a 10-foot-wide

The author is field information specialist, Soil Conservation Service, Upper Darby, Pa.



The trailer park and recreation area of Sam Showell's White House Farm on Indian River Bay in Delaware.

Shore erosion like this threatens beach cottages along the Atlantic Coast.

Sam Showell kneels on his grassed beach at the high water line of the big storm of March 1962.

strip across the beach. This grass formed a tight sod on the critical part of the beach. Finally, he seeded Kentucky 31 tall fescue on the top 35 feet of the slope. This formed a healthy, deep-rooted, lawn-type grass that, when properly fertilized, resists heavy foot traffic.

A Jute fiber mesh, that decays after a few months, was used to protect a few critical areas before the grass provided the cover.

Showell's grass-covered beach proved its value when the March 1962 storm spread destruction along the Atlantic Coast. Although 8-foot flood-tides pounded the area for 2 days, and nearby beaches were ripped to shreds, the high waves rolled harmlessly up the long, protected slope on White House Farm.

"The new beach cost us $3,500," Showell says, "but, in that one storm, it more than paid for itself."

Actually, the beach has gained a few feet of new sand since it was reshaped and grassed. Proper maintenance is the real secret—fertilizing and mowing keep the grass in good shape.

"Our recreation enterprise is growing larger each summer, but parts of the farm are still used for agriculture," Showell points out. "A neighbor rents part of our land for soybeans and corn, but all of it could be turned back to farming if the need should arise. In the meantime, we plan to make our recreation projects keep the farm on a paying basis."

◆

ELFAC—Electronic Farm Accounting—is a system of business record keeping with an electronic computer. It is a creation of Farm Management Extension people in 13 Northeastern States, and is designed to help farmers keep better financial records at a minimum cost for income tax and other purposes. The services of ELFAC are hired by farmers just as they might hire an accountant. Because the bookkeeping is done by machine and the system is operated on a nonprofit basis, the cost of ELFAC is reported to be relatively small—for example, approximately $1.25 per cow a year to a dairy farmer.

◆

USDA studies found that a ton of wheat straw mulch an acre cut erosion to a minimum and that 2 tons stopped runoff and soil loss in fallow plots.

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SOIL CONSERVATION IN SOUTH AFRICA. By J. C. Ross. 84 pp. 1963. Department of Agricultural Technical Services. Printed in the Republic of South Africa by Government Printer. Pretoria.

This exceedingly well written publication presents an up-to-date report of progress of the soil conservation program in South Africa since enactment of the soil conservation act of 1946.

J. C. Ross skillfully maintains reader interest through presentation of a brief physical and human background, the problems the nation faced, and what was done to meet the problems.

During the 12 years a soil conservation act has been in active operation, 734 soil conservation districts have been proclaimed, covering 98 percent of the total private lands in South Africa. More than 22,000 detailed farm plans have been prepared and are being applied on the land.

The soil conservation act provides for creation of a democratic soil conservation board of 15 members to advise and assist the ministry. The act provides that any defined area of land may be proclaimed as a soil conservation district upon request of the landowners concerned. Such a proclamation places an obligation upon every owner of land in the "district" to reclaim, conserve, or improve his land as may be necessary.

As soon as a district is proclaimed, a soil conservation district committee is established by the minister to manage the affairs of the district. Members of the committee consist largely of local farmers elected by the landowners. Duties of the committee are to prepare a soil conservation district scheme, and to see that a detailed scheme (called a farm plan) is prepared, within the broad framework of the district scheme, for every individual property in the district.

The act provides that the State may proclaim any area as a soil conservation area if conservation needs require.

The Minister is empowered to grant financial assistance in carrying out provisions of the farm plan or other measures approved by the minister. The act provides for appropriate penalties, fines or imprisonment, or both, for failure to carry out provisions of the approved soil conservation scheme.

—Carroll Dwyer

Thou shalt cherish thy soil and keep it.

EDITOR RETIRES

Frank B. Harper, Editor of *Soil Conservation* for the past 3 years, retired March 31 because of ill health. He had worked for the Soil Conservation Service nearly 28 years, the past 20 in Washington.

The editorial work will be carried on by Ben Osborn, who came to the Washington Information Division in 1955 after 20 years in field offices of the Soil Conservation Service.

◆

Residue kept on your fields builds up the organic matter of the soil and reduces wind and water erosion.

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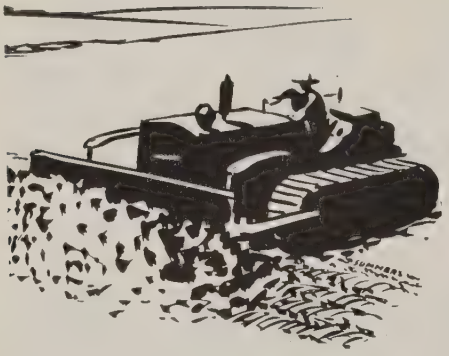


Soil Conservation
25 Years Ago

"Taking firm root in rural America —spreading like a healthy kudzu vine— is a new concept of land use. Rarely, if ever, has an agricultural principle or program or philosophy germinated so surely, so quickly, or in so many environments.

"Ideas are trail-blazers of human progress. Ideas, as distinguished from things. And it is a pioneer idea — an idea which states the logic and traces the broad pattern of a permanent husbandry—which has its blueprint in the soil conservation districts. . . .

"The picture is of minds and men in meeting, of human relationships, and social intangibles. Mass education and intensive activity; the farmer on the one side and the technician on the other; soils' problems in the same bag with economic problems; the farmer pressing to obtain service and the district staff struggling to satisfy his need: These, too, are important to the drama of a young idea hastening to maturity."

VOL. XXIX, NO. 11 JUNE 1964

CONTENTS

Page

243 Earthmoving Big Part of Soil and Water Conservation
By C. J. Francis and Sellers G. Archer

246 Rubber Tube Solves Seepage Problem in Ditch
By H. W. Riek

247 Soil Mechanics Tests Guide Design of Earth Structures
By Rey S. Decker

249 Cost of Parallel Terraces Depends on Amount of Earthmoving
By W. C. Little

251 Watershed Project Protects City Against Floods
By Donald J. Anderson

252 Building a Floodwater-Retarding Dam
By William T. McClure, Jr.

254 Flood Prevention Story Gets Headlines
By Walter S. Allen

255 Was the Ohio Flood Necessary?
By H. O. Ogrosky

256 Contractors Bring New Know-how to Conservation Work
By Leonard Morris

257 Water Leveling Riceland Saves Labor and Water
By K. V. Stewart, Jr.

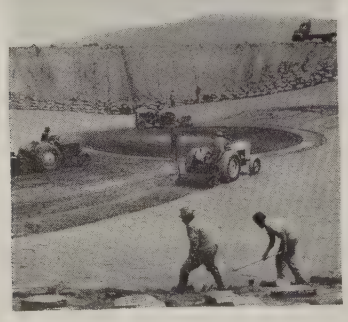
258 Basin Irrigation Stops High Pumping Costs
By John Colvin, Jr.

260 "Watershed Philosophy" Spreads Along Hadley Creek
By Hampton H. Long

261 Land Grading Raises Yields and Benefits Economy
By Robert H. Landers

262 Teaching Students Tie Conservation to Subjects
By John M. Cross

264 Book Review



COVER PICTURE—Soil-cement lining being applied to prevent seepage of reservoir in Riverside-Corona Soil Conservation District, Horsethief Canyon, Calif. Workmen spread cement by hand and use rototillers to mix it with surface soil. Operations start at center and work in circle outward. — Photo by Earl R. Shade.

Soil Conservation

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Assistant Secretary for
Rural Development and Conservation

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

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BEN O. OSBORN, Editor

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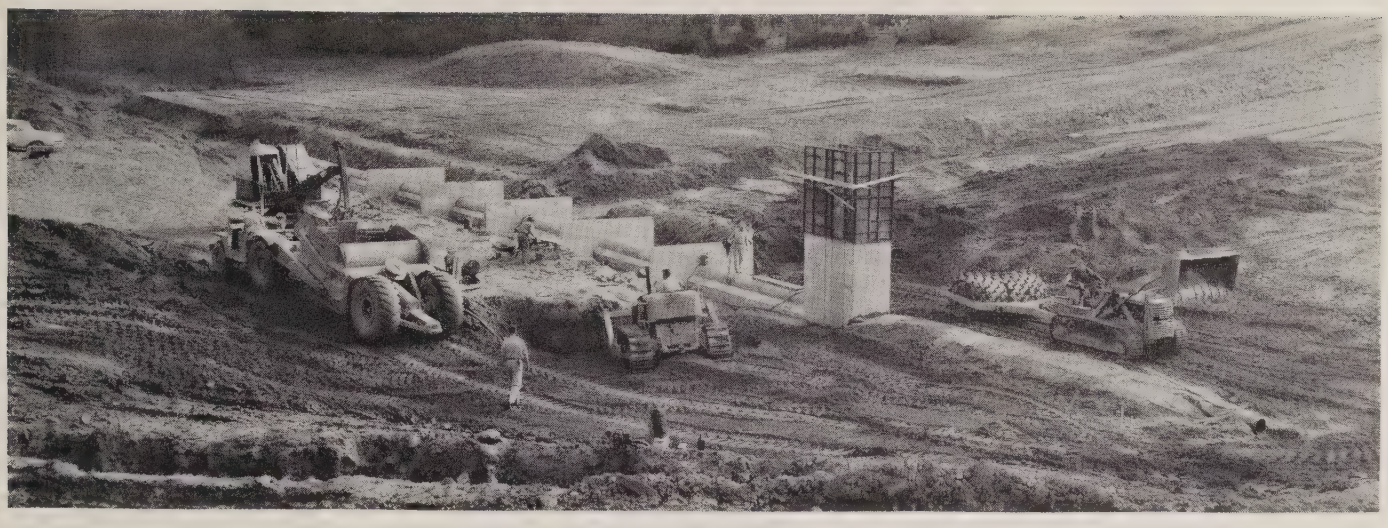


Earthmoving Is Big Part of Soil and Water Conservation

By C. J. Francis and Sellers G. Archer

THE engines of a flying freight train speed by as you reach a crossing. Large gondola-type cars are all filled with earth, and on the side of each is printed, "Load limit, 140,000 pounds." You turn off the engine of your car to wait. It is 6 a.m. on Monday.

You know the weight of a cubic yard of earth, so you estimate that each car carries about 62 cubic yards. You count 110 cars a minute, and estimate that in 15 minutes you may see 100,000 cubic yards pass. Fascinated, you watch the freight speed endlessly by. The cargo never varies. You wait and wonder what large project is under construction.

Soon it is noon. Then it is 6 p.m., and you estimate that 80,000 cars and 5 million yards have passed. You can't wait longer, so you give up and turn back. Later you learn that the weird train blocked the crossing for 2½ days, 65 hours to be exact. A total of 428,220 cars carried 27 million cubic yards of earth by that crossing.

Of course there can't be any such train, but watershed construction under Public Law 566 in the United States caused that much earth to be moved last year.

A small army of contractors built 235 dams, improved 300 miles of stream channel, and built many other structures in 306 watersheds.

Considerably more is scheduled for 1964. State conservationists estimate the earthmoving total at more than 36 million cubic yards. About 25 million will go into 3,161 dams, 8 million will be moved from 300 miles of channels, and 3 million will be moved in other construction. It would take our phantom train 90 hours to move this load.

To get another picture, put all of this earth in one dam 30 feet high, with a 14-foot top and normal 2:1 and 3:1 side slopes—the dam would be 68 miles long!

And the conservation earthmoving job will not be finished in 1964. This is clearly shown by the study of watershed project needs in the National Inventory of Soil and Water Conservation Needs. In a nationwide survey, Federal and State agencies found that some 8,300 upstream watersheds containing about a billion acres are in need of planned programs of protection and development involving community action.

These watersheds make up about half the total area of the United States, exclusive of Alaska. The projects approved to date cover only 2.66 percent of the total land area; 2.82 percent in the east and 2.48 percent in the west. This shows how small a start has been made.

Experience to date indicates that project development is economically justified on about half of the watersheds needing treatment. The probable total cost is estimated at an average of $25 per acre. Current practice under the Watershed Protection and Flood Prevention Act (Public Law

The authors are director, Engineering Division, Washington, D. C., and field information specialist, Spartanburg, S. C., both of the Soil Conservation Service.

566) would provide about $15 per acre as the Federal share. Thus, the long-term total need for Federal investment may be in the order of $7.5 billion for watershed projects.

An analysis of structural measures included in 473 work plans for watershed projects authorized for operations as of June 30, 1963, gives some idea of the construction work these projects will generate. Its total cost is estimated at $479,200,000.

The project plans call for 3,003 floodwater-retarding dams estimated to cost $244,000,000, or 51 percent of the total for structural measures. A close second, 6,555 miles of channel improvement will cost 31 percent of the total, or $149,000,000. Multiple-purpose dams, dikes, grade stabilization structures, floodways, and diversion debris basins and other structures make up the remaining 18 percent or $86,000,000. Most of the 1,019 grade stabilization structures are in the loess areas adjoining the Missouri River in Nebraska, Kansas, Iowa, and Missouri.

The proportions between different types of structures likely will change in the future.

Since the foregoing figures were tabulated, the Act has been amended to include recreation as an authorized purpose eligible for cost-sharing. Multiple-purpose dams already are receiving greater emphasis in work plans.

Floodwater-retarding dams now authorized call for moving about 252 million cubic yards of earth. Some average dimensions, obtained from a summary of the 3,003 structures contained in work plans authorized for operations as of July 1, 1963, are:

Total cost (Federal and local)	$82,000
Fill, cubic yards	80,650
Sediment pool capacity, acre-feet	144
Floodwater pool capacity, acre-feet	895
Water supply pool capacity, acre-feet	2,230
Surface area of sediment pool, acres	28
Surface area of floodwater pool, acres	75
Surface area of water supply pool, acres	161

Channel improvement is the second most important type of construction. Visualize, if you will, a single continuous channel from Omaha to Washington, D. C., from Washington to Boston, from Boston to Seattle, from Seattle to Los Angeles, and from Los Angeles back to Omaha, and you will have some idea of the mileage of stream channels that had been authorized for improvement as of July 1, 1963. The excavation involved in channel work exceeds 160 million cubic yards.

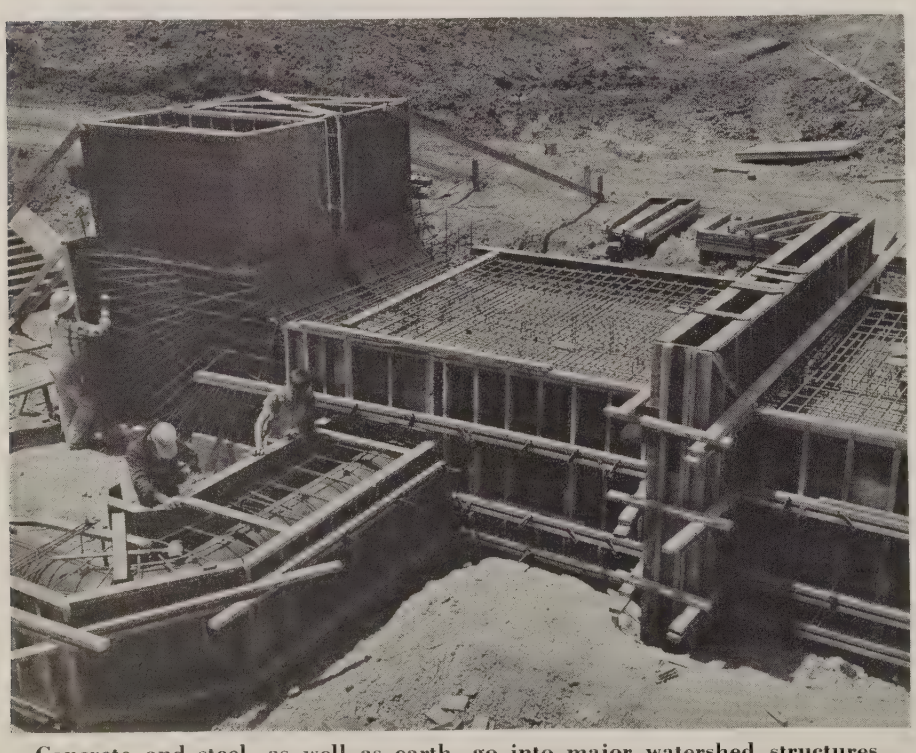
But watershed construction isn't all earthmoving. This year's work will require more than 50,900 cubic yards of concrete, thousands of feet of concrete and steel pipe, acres of soil cement and rock riprap, tons of reinforcing steel, carloads of lumber for building forms, hundreds of large valves, and many other materials.

A hypothetical train that could carry this earth and other material would be 6,000 miles long!

Another monstrous train would be needed to transport men and equipment to the sites of about 316 dams, 300 miles of stream channels, and other operations on 327 watershed projects in the United States and Puerto Rico.

Although watershed construction is more spectacular, the regular land treatment applied on individual farms in soil and water conservation districts and watershed projects accounts for the major part of conservation earthwork. It is estimated that half a billion cubic yards of earth was moved in applying soil and water conservation practices in fiscal year 1963. Following are some of the major construction practices reported:

Diversions, miles	3,310
Grass waterways, acres	124,970
Ponds	53,886
Terraces, miles	40,577
Land grading and smoothing, acres	378,542
Land leveling, acres	511,125
Irrigation reservoirs	1,613
Irrigation canals, miles	538
Drainage ditches, miles	9,083
Stream channel improvement, miles	756
Grade stabilization structures	7,518
Tile drains, miles	29,125
Water spreading, acres	35,810
Ditch and canal lining, miles	1,648



Concrete and steel, as well as earth, go into major watershed structures.

One of the major earthmoving practices on individual farms is land leveling of irrigated cropland. This practice provides a smooth field surface that enables the farmer to apply water uniformly, thus improving irrigation efficiency and reducing labor costs. More than 7 million of the 36 million acres of irrigated land in the United States has been leveled. About ½ million acres is leveled annually. Assuming an average of 400 cubic yards of earth moved per acre treated, the total annual workload is 200 million cubic yards. The cost of this one conservation construction operation is about $50 million.

Land grading and smoothing to improve field drainage is a new practice that is gaining favor with farmers. Accurate land grading eliminates shallow surface ponding, creates a uniform seed bed, and permits more efficient farming. Farmers in recent years have bought several thousand land levelers that can be drawn by farm tractors.

The Soil Conservation Service provided technical assistance on more than 36,000 acres of land grading and 342,000 acres of land smoothing during the last fiscal year.

Surface drainage systems and related practices require much earthmoving. The construction of shallow ditches by grading equipment or deep ditches by draglines is required on most flat fields to remove excess water. The SCS provided technical assistance on nearly 8,000 miles of field ditches and more than 9,000 miles of drainage mains and laterals in every section of the country during the last fiscal year.

At first glance one might think that conservation construction had reached its limits. Nothing could be farther from the truth. When these figures are related to the arable land area of the United States and the still unmet need for conservation work, the end of earthmoving is not in sight.

Land leveling and other farm practices account for major part of conservation earthmoving.

Moreover, the rapid technological progress being made in farming requires that the individual farmer constantly improve efficiency of operations to compete economically. We can, therefore, expect continuing improvements in old measures and constant expansion of conservation work, all of which will generate earthmoving operations.

DO-IT-YOURSELF CONSERVATION AT HOME

Urban and suburban lot owners in Pennsylvania's populous Montgomery County near Philadelphia were advised this year by the Wissahickon Valley Watershed Association how to carry out a do-it-yourself "Conservation At Home" project.

"No one would even consider building a house without a plan," the nonprofit citizens organization dedicated to the preservation and conservation of the beauty and natural resources of the watershed pointed out in a leaflet for homeowners. "Yet most home grounds, as important as they are to the home setting, just grow like Topsy. You owe it to yourself to plan for the proper planting and conservation of the soil and water on your own property."

The association explained how to make a conservation plan by drawing a sketch map of the property, noting conservation problems, and selecting appropriate conservation measures from a "basic 10" list provided in the leaflet. Included are:

Planting trees for shade and fuel-saving windbreaks; soil erosion control, especially on new lots, through lawn improvement, grass waterways, diversion terraces, and stabilizing steeper slopes with sod strips or vines; laying out garden rows on the contour across slopes, using alternate strips of cover crops like oats or ryegrass on tilled ground, and building a compost pile or pit; and growing plants that provide food, cover, and nesting areas for wild birds.

Rubber Tube Solves Seepage Problem in Irrigation Ditch

By H. W. Riek

WATER for 1,500 acres of fertile cropland near Red Lodge, Montana, in the Carbon Soil and Water Conservation District comes by diversion from the Clark's Fork River.

Where it crossed a 950-foot stretch of steep, unstable hillside, it ran into trouble.

Originally, the 12 participants in the Clark's Fork and Silver Tip Ditch Company built a metal flume to cross the stretch. This was all right for a time but when maintenance costs began climbing, they replaced the flume with a ditch skirting the hill.

Real trouble started then. The soil began to slip. Large cracks showed up along the canal and below it. Time after time heavy equipment was rushed to the slope for repairs.

The author is area conservationist, Soil Conservation Service, Billings, Mont.

A Soil Conservation Service geologist after a study reported the soil movement was resulting from a layer of fine clay-like material that was lubricated by moisture deep within the hill. That made the situation look hopeless. Conferences began with representatives of the Farmers Home Administration, which was financing the ditch company, as interested participants.

First this solution and that were proposed. All were discarded as being too expensive or unworkable. Somebody suggested a huge rubber tube which could move with the changing surface of the earth or which could be shifted while repairs to the earth base were made.

A Denver firm made the tube—4 feet in diameter and 875 feet long—of butyl rubber with nylon fabric reinforcement. The tube wall is less than a quarter-inch thick, which permits relatively easy handling. The entire tube can be rolled up and stored in winter. Life expectancy is reckoned at 15 years.

Small holes in the tube can be patched in about the same way automobile tires are repaired.

The tube has been doing a completely satisfactory job of delivering water to the thirsty croplands below.

Soil slip below hillside ditch resulting from irrigation water seepage.

Inlet end of butyl rubber tube used to carry water over unstable soil.

Have You Seen?...

● "Genesis and Hardening of Laterite in Soils," by Lyle T. Alexander and John G. Cady, Soil Conservation Service, USDA Technical Bulletin 1282. Laterite is a highly weathered material, found particularly in tropical countries, that hardens upon exposure to wetting and drying, as under clean cultivation and erosion. The bulletin reports on a study of the process of laterite formation in tropical Africa, in order to obtain a better understandng of soils containing laterite in the warm-temperate and subtropical Southern States, Puerto Rico, and Hawaii, with a view to improvements in their recognition, classification, and long-time productive use.

Soil Mechanics Tests Guide Design of Earth Structures in Conservation

By Rey S. Decker

A COOPERATOR in a soil conservation district needs a large stock-water dam in a dry pasture.

The president of an irrigation district asks for assistance in raising the dam of an irrigation reservoir.

The main channel of a troublesome stream must be enlarged to provide flood prevention.

The Soil Conservation Service engineers who plan, design, and construct the many kinds of projects involved in soil and water conservation programs must have reliable information about the kind of soil at each site and how it will behave as construction material.

To provide more precise information for specific jobs than can be obtained from standard soil surveys, the SCS annually tests and analyzes thousands of soil samples taken from proposed construction sites.

These tests are made by a central Soil Mechanics Laboratory at Lincoln, Nebr., and by materials testing sections of the Engineering and Watershed Planning Units at Fort Worth, Tex., Spartanburg, S. C., and Portland, Oreg. The central laboratory establishes technical standards for all the work and makes tests requiring equipment not available at the EW&P units.

As the volume of construction work serviced by SCS engineers has grown, the workload of the Soil Mechanics Laboratory has increased as well. In 1956, the laboratory conducted tests on nearly 6,400 samples from 462 sites. In fiscal year 1963, the laboratory and EW&P units tested nearly 11,000 samples and prepared recommendations for 913 sites.

When a construction job is planned where soil mechanics information will be needed, fieldmen from the State or local SCS staff make the field survey and geologic investigation. They take soil samples and forward them to the testing location with reports by the engineer and geologist. The laboratory makes the tests and prepares a report of the findings and recommendations for the design engineer responsible for the job.

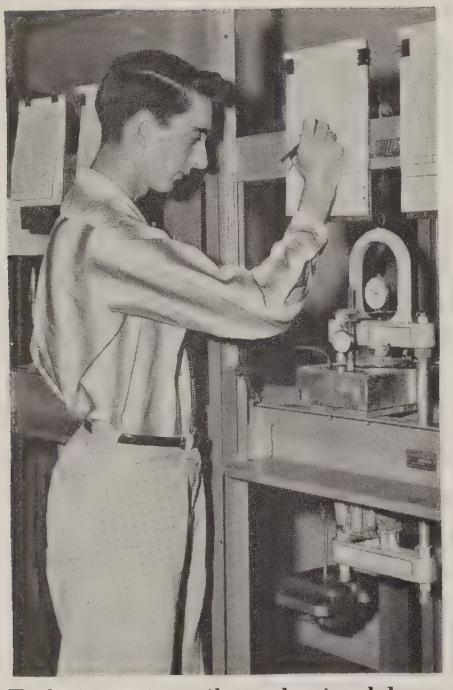
Providing the information needed by the design engineer involves many technical fields. Engineering geology, soil mechanics, and foundation engineering, especially, are united in defining the engineering properties of soils and applying this knowledge to safe and practical design of structures founded upon, built with, or excavated through soil materials.

The amount of soil engineering information needed and the details of applying it vary with the nature and scope of each project. In SCS operations, earth dams make up the major part of the workload in this field. This is true not only because of the amount of this kind of construction but also because of the difficulty of predicting the exact behavior of an earth dam and its foundation during construction and after completion.

For example, all soils will transmit water, some rapidly, others

Core drill obtains samples of foundation material along centerline of watershed dam.

The author is head, Soil Mechanics Laboratory, Soil Conservation Service, Lincoln, Nebr.



Technician in soil mechanics laboratory measures consolidation of building material.

very slowly. A zone of saturation and seepage develops in earth dams that impound water for long periods. Depending on the properties of the soil used, the dam must be properly designed to prevent this seepage zone from outcropping on the downstream slope and developing a "slip zone."

Earth dams move and the movements are measurable. They may move upward, downward, or sideways. The movements are predictable, and can be compensated in the designs if the properties of the foundation and fill materials are known.

Several months' time and many engineering specialties are used in preparing plans and specifications for an earth dam. Surveys must be made of the damsite and reservoir area. The hydrology and streamflow characteristics of the watershed behind the dam must be studied and evaluated. Results of these surveys and studies are used to establish the most practical height and length of dam for the intended purpose.

Detailed investigations of surface geology and subsurface materials must be conducted. Test holes are bored in the foundation area and in areas that will supply the materials to build the dam. Samples of soil and rock from the holes are carefully classified and described. Core samples representing each kind or condition of material are collected for testing.

Many kinds of tests are used to determine the engineering properties of soil and rock materials. It is important that the tests duplicate as nearly as possible the conditions that will exist when the dam is completed. The testing program for each project is planned to provide factual data that can be used to predict the behavior of the foundation and the embankment.

Measurements of consolidation or settlement are used to predict movements of the dam and of any conduit through it.

Tests of seepage potential or permeability of the foundation and embankment are important. Deep cutoffs into the foundation or clay blankets over the reservoir bottom may be necessary to eliminate excessive foundation seepage. Drains and relief wells may be needed to reduce uplift pressure under the dam.

Tests of the strength of foundation and embankment materials indicate the needed slopes of a dam. Shear strength may dictate the placement of different kinds of soil in the embankment. Wide berms are often needed when foundation materials are weaker than the embankment.

Tests of compaction of soils are made to provide design data and are used during construction to make sure that the design is being followed.

All soils are variable; no two test holes or samples are ever exactly alike. Superior engineering judgment and experience, therefore, are needed in addition to test results to predict the ultimate behavior of the dam, the foundation, and the reservoir.

Practical Information For Community Planners

Practical information on intelligent long-range planning for the use of land and water resources is presented in a 30-page publication on " A Citizen's Development Plan for Every County" recently published by the University of Wisconsin Extension Service. The illustrated circular, by Walter A. Rowlands of the Department of Agricultural Economics of the College of Agriculture at Madison, has national application.

The foreword by J. H. Beuscher, law professor at the University, says in part:

"Today, increasingly, automotive and technological development, urban sprawl, recreational mushrooming and declines in rural population are pushing forward great and growing citizen interest in local community planning, that is, in study, analysis, and forethought about the future of one's own home area.

"As Americans we have rationally planned our homes, our farms, our businesses. Now we are at last anxious to plan our communities, too. As a result, citizens once willing to let Jones do it are ready to pitch in and devote long hours to land use or economic base studies, to educational, transportation, or recreational surveys and the like. How to organize and go about these tasks—this is what this circular is all about.

"But citizens alone cannot do the job. Mr. Rowlands shows how you can enlist the help of technically trained people now working in your community—soil conservationists, recreationalists, agricultural advisers, school men, and others. In addition he points to the trained professional planner as a vital source of help. By getting John Q. Citizen involved in the planning process, however, a basis for community understanding and acceptance of expert suggestion is laid."

Cost of Parallel Terraces Depends Largely on Amount of Earthmoving

By W. C. Little

ROUGH fields with short rows can be transformed into smooth fields with long rows to permit efficient operation of the large machinery required by modern farming. The conversion often requires a great deal of earthmoving, but the resulting savings in operating costs in most cases more than pay for the change. Recent studies in the Piedmont area of Georgia and South Carolina show that machinery operating efficiency may be increased as much as 24 percent with parallel terraces and parallel crop rows.

Almost always, some earthmoving or landforming is required before parallel terraces can be constructed. Gullies, old bench terraces, dead furrows, and other irregularities on a field must be smoothed. The amount of soil that must be moved can be reduced to a minimum by careful planning that takes advantage of existing drainage and erosion patterns. For example, placing vegetated waterways in natural depressions simplifies the alinement of terraces.

Not all land can be terraced economically with a parallel system, and it is seldom feasible to make all terraces in a field parallel. A nonparallel terrace interval located where slope changes abruptly will reduce the cost of alining the other terraces.

Cost records were kept during construction of parallel terraces and waterways on five farms in the Piedmont studies conducted by the Agricultural Research Service in cooperation with the Soil Conservation Service. Four of the systems were designed specifically for row crop fields and one for a peach orchard. The systems for row crops had spacings of 67 to 80 feet between terraces, depending upon the slope of each field. The terraces for peaches were 22 feet apart to permit a row of trees on each terrace ridge. The cross-section of these terraces was about one-third as large as regular terraces.

The locations for waterways were selected before laying out the systems. The soil removed from the waterways was used to fill gullies, dead furrows, and other low areas in the field. Then, old bench terraces were leveled and the entire field was smoothed to improve terrace alinement. The cost of this operation depended on how much soil was moved and how much smoothing was done. It ranged from $3.08 per acre where 256 yards was moved on 18.1 acres to $8.90 per acre where 1,494 yards was moved on 18.6 acres. The cost averaged $6.38 per acre for all fields studied.

The cost of land smoothing is the most variable item in constructing parallel terraces. It depends mainly on the amount of earth to be moved because of the prior condition of the field. The size and type of machinery also affect costs. Usually, the larger and more costly machines are the most efficient earthmovers per unit of time.

The cost of constructing waterways depends upon the amount of soil to be moved, which, in turn, is determined by the length and cross-sectional area of the waterway. The waterways on the five farms studied were constructed with several different types of

Aerial view of parallel terraces on a nursery in Tennessee shows the absence of point rows.

The author is research agricultural engineer, Southern Piedmont Soil Conservation Field Station, Southern Branch, Soil and Water Conservaton Research Division, Agricultural Research Service, Watkinsville, Ga.

A "bottomless" scraper smoothing the land between terraces.

An "elevating" scraper cutting a high spot from channel.

machines. The cost varied from \$0.09 per cubic yard with a 4-cubic-yard elevating scraper to \$0.12 per cubic yard with a bottomless scraper. Both scrapers were towed with 3- to 4-plow size farm tractors. Waterways on one farm were constructed with a track-type tractor towing an 8-cubic-yard scraper at a cost of \$0.09 per cubic yard for 1,869 cubic yards of earth moved. Motor graders were used on two farms at a cost of \$1.23 and \$1.38 per 100 feet of waterway. Since motor graders only "roll" soil, it is not realistic to express the production on a per-cubic-yard basis.

A key terrace was laid out in each field after land smoothing was completed. Then other terraces were laid out parallel to the key terrace. Whenever it was not feasible to follow the key terrace, a conventional terrace interval was inserted and a new key terrace located.

Terraces with an average cross-sectional area of 9.2 square feet were constructed with motor graders at a cost of \$0.67 to \$0.75 per 100 feet and an average cost of \$0.72 per 100 feet. The small terraces for peach trees cost only \$0.28 per 100 feet. The terraces in one field were constructed with a two-bottom moldboard plow at a cost of \$0.86 per 100 feet.

Costs reported here represent only the actual ownership and operating costs (fuel, engine oil, lubrication, etc., and operator's wages) and do not reflect rental or contract costs.

No. 75

This is the seventy-fifth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Have You Seen?...

• "Engineers in the Soil Conservation Service," USDA Miscellaneous Publication 956. The Soil Conservation Service carries on a wide variety of work that requires the services of engineers. This booklet describes and illustrates many of the activities in the field and office. It also emphasizes SCS's intensive and specialized training in many fields of engineering as well as its free specialized training in colleges and universities to highly qualified employees.

• "Soil Erosion, the Work of Uncontrolled Water," by R. D. Hockensmith and J. G. Steele of the Soil Conservation Service, USDA Agriculture Information Bulletin 260. Loosening soil particles by the impact of raindrops or by the scouring action of runoff, moving the detached particles by flowing water, and depositing the particles at new locations are the three principal steps involved in the process of soil erosion by water. The bulletin discusses this process in detail.

• "Watershed Protection, Flood Prevention Serves Land, People, Commerce, Industry," by the Soil Conservation Service, released by USDA. Railroads are an inseparable part of the Nation's watershed work. For example, 14 projects listed in this folder have helped to eliminate railroad damages caused by floods in Western United States. People, land, and industry are reaping unforeseen dividends from watershed work, including new opportunities for site developments, new housing, and improved locations for business and small industries.

◆

A soil psychrometer for measuring the relative humidity of air in the soil has been developed recently by the Department of Agriculture to aid basic research on soil moisture and the part it plays in plant life.

Watershed Project Protects Montana City Against Floods

By Donald J. Anderson

THE people of Plentywood in northeastern Montana are assured of a flood-free future since completion of a flood protection and fish and wildlife water-impoundment dam in the Box Elder Creek watershed just north of the Sheridan County seat.

The project, developed through the Watershed Protection and Flood Prevention Act (Public Law 566), was sponsored by the City of Plentywood and the Sheridan County Soil and Water Conservation District. The dam was built at a cost of $225,110. The Soil Conservation Service provided engineering services and $210,475 in cost-sharing of the structure.

The 90-acre lake to be impounded by the 60-foot high, 1,700-foot long dam will provide additional benefits in boating, fishing, and picnicking. The Montana Fish and Game Department contributed $15,000 for additional water storage for fish and wildlife purposes, and has tentative plans for stocking and managing the reservoir for trout.

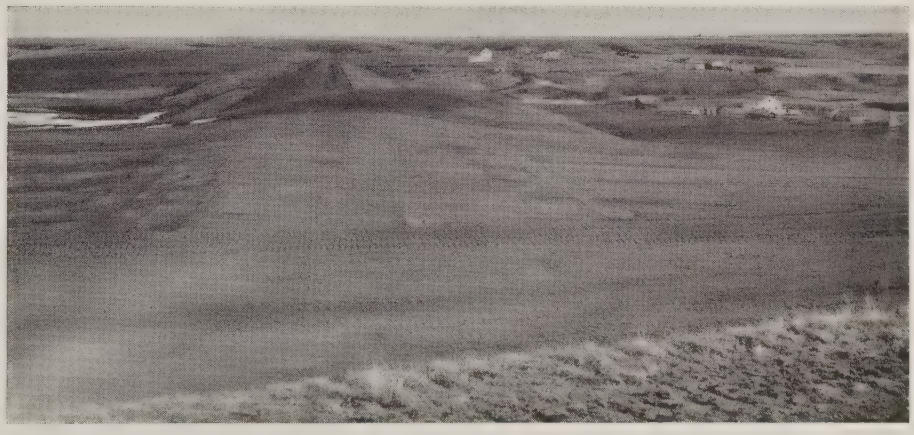
The dam was designed by Soil Conservation Service engineers to give maximum protection, both to the City of Plentywood and to the bottom-land area below. The flood-water-retarding capacity of the project is enough to handle two consecutive storms as big as the disastrous storm of 1953, although it is considered that kind can be expected in this area only once in 100 years or longer.

Mayor Vernon Christensen said in announcing acceptance of the Box Elder Creek project by co-sponsoring Plentywood:

"Our community has a big stake in this project. Protection against the threat of another devastating flood is something that we have desperately needed for the future development of our city."

Mayor Christensen and other local leaders are planning for the development of the area for recreation uses. This is the first project of the kind in Montana to be eligible for SCS assistance under the new authority for technical and cost-share help in specific kinds of recreation development connected with watershed projects, for the benefit of an entire community.

Most of the 18 landowners on the 20-square-mile drainage area above the lake are cooperating with the Sheridan County district. They are installing such soil stabilizing and improving measures as stripcropping, contour cultivation, grassed waterways, and the proper use of range to insure a long and useful life for the project by forestalling rapid silting of the reservoir. The City of Plentywood has assumed responsibility for the maintenance of the flood-protection works proper.



Box Elder watershed dam was under construction in September (top), completed by the end of November (spillway in foreground).

The author is work unit conservationist, Soil Conservation Service, Plentywood, Mont.

An award-win

Building a Floodu

By William

SPILLWAY EXCAVATION (Far L.). Area being exc vated for principal spillway pipe under the dam.

MECHANICAL SPILLWAY (Top L.). Workers joining se tion of concrete pipe in completed excavation.

ANTISEEP COLLARS (Top R.). Concrete wings preve water from seeping along outside of pipe through dam.

The author is soil conservationist in the Oconee Work Unit, Soil Cons

picture story

er-Retarding Dam

cClure, Jr.

TWO-STAGE RISER (Far R.). Opening halfway up inlet ructure slows flow of water from heavy rains.

EARTH EMBANKMENT (Lower L.). Earth excavated om emergency spillway is compacted into dam.

GRASS COVER (Lower R.) Sprinkler irrigation helps start rmudagrass sprigged on dam and spillway.

Service, Walhalla, S. C.

Flood Prevention Story Gets Southeast Headlines

By Walter S. Allen

HEADLINES from the bayous of Louisiana to the Blue Ridge Mountains of North Carolina tell the story of how well small watershed protection and flood prevention projects have done.

Various recreational and other individual and community benefits also are reflected in the words of local people in the accompanying accounts. A half-dozen or so examples are representative of the flood-prevention headlines stories published all over the Southeast:

Seneca, South Carolina: *Flood Dams in Coneross Tame Overflowing Creeks.* — Two pictures told the flood prevention story. One, taken before the Coneross Creek watershed project was started, showed a road and bridge under water; the other, made after two dams were built, showed the same bridge and road dry and open to traffic.

The Blue Ridge Shrine Club has built a $5,000 clubhouse on a 2-acre lot overlooking one of the lakes.

Wynne, Arkansas: *Watershed Project Protects Town.* — O. H. Pool, long-time resident of Wynne, recalled: "I remember some big floods back in the '20's. We used sacks of flour for sandbags, but the water got 11 inches deep in the stores, anyway. But since we got the Caney Creek watershed project, the creek runs less than half full after the heaviest rain. The project also saves the farmers in the county about $150,000 a year."

Walnut Cove, N. Car.: *Watershed Dam Increases Land Value Three Times.*—"The value of land and crops in the flood plain has increased three times since this dam was completed," Ralph Mills, chairman of the Stokes County Commissioners, reported.

He was talking about the first dam completed out of 13 planned in the Town Fork Creek watershed. He said 3-inch rains flooded the area in the county outside the watershed.

Plain Dealing, Louisiana: *Ten-Inch Deluge Fails to Disturb Town.* — Outside the Upper West Fork Cypress Bayou watershed floodwaters heavily damaged more than 300 acres of crops, washed out bridges, and stopped traffic on main highways. But the residents of Plain Dealing slept soundly, because they were protected by three floodwater-detention dams.

"It's the best thing that ever happened to our community," said Mayor Leon Sanders.

To which Curtis Gleason, local automobile dealer, added: "Before we had the watershed project, every store in town would have had water in it after a rain like that."

The town has developed a recreation area on 60 acres of land it owns around 2 of the lakes, where as many as 3,000 people a day have enjoyed swimming, boating, picnicking, and fishing. One of the lakes was enlarged to store water for the town and for industry, and another for recreation.

Roanoke, Alabama: *$28,000 Saved in Bridges and Roads.* — That was, in effect, what the Chambers County Commissioners Court reported taxpayers had saved in flood losses prevented since three dams in the High Pine Creek watershed project were completed in December 1961.

And God said, "Let the waters under the Heaven be gathered together unto one place, and let the dry land appear . . ."

"Before this dam was built and the channel completed I had no outlet to drain my 20 acres of bottom land," J. B. Birdsong, Jr., said of the benefits of one of the dams to his farm. "That land wasn't worth a dime an acre. Now, I wouldn't take $200 an acre for it."

This other headline in March 1962 is representative of those appearing, also, in earlier years since Congress in 1953 authorized Federal participation with States and local communities in small-watershed programs, developed through pilot projects designated by the U. S. Department of Agriculture's Soil Conservation Service, and through locally initiated 1954 Watershed Protection and Flood Prevention Act projects:

Coffeeville, Miss.: *Heavy Rains Fail To Flood Town.* — "If that (the rains) had happened before the Turkey Creek watershed project was built you could have floated boats in and out of the stores," said A. A. Bryant, president of the Chamber of Commerce.

He said the project protects the town and some 4,000 acres of good bottom land that formerly was flooded after every heavy rain.

The author is field information specialist, Soil Conservation Service, Spartanburg, S.C.

Was the Ohio Flood Necessary?

By H. O. Ogrosky

SINCE the devastating flood on the Ohio River in March, the Soil Conservation Service has received many inquiries about the possible effects of small watershed projects in major storms such as that one.

The Soil Conservation Service, the Weather Bureau, and the Geological Survey are still gathering information on the Ohio valley storm and resulting runoff. The data already at hand clearly show that this was an exceptional event of a kind that makes complete defense uneconomic and impractical.

Watershed treatments of the kind carried on by soil conservation districts and other local sponsors with the assistance of the SCS can reduce damages on small tributaries but they cannot prevent flooding of major stream valleys after rains of such magnitude.

The March 10 edition of *The Post and Times-Star,* Cincinnati, Ohio, carried the following reports on the flood situation:

"Record rains spilled floodwaters from Arkansas to Pennsylvania today, driving more than 4,000 persons from their homes . . .

"Kentucky reported 3,000 persons evacuated from homes . . .

"Disaster crews in Poplar Bluff, Mo., worked feverishly through the night with highway police, national guard and army units to lead sleepy residents from their homes before the rain-swollen Black River smashes through a levee . . .

"Steady rains throughout Ohio forced many families from their homes . . .

"In Indiana at least 25 roads were blocked by high water and flash floods throughout the southern part of the State."

Area of excessive rainfall, March 3 to 10.

The general area of heavy precipitation covered a band roughly 150 miles wide from northeastern Missouri to New York. The amount of rainfall on March 3 to 10 is something that people living in the area will probably not see again. No doubt, most of them will be well pleased if they do not.

In Paducah, Ky., for example, 5.6 inches of rain fell on March 3 and 4. Another 3.5 inches fell on March 8 and 5.7 inches on March 9. This amounts to 9.2 inches in 2 days and 14.8 inches in 7 days.

According to studies by the Weather Bureau for the SCS (in press) the rainfall that can be expected once in 100 years on the average at Paducah is 8.2 inches in 2 days and 11.5 inches in 7 days. The reported 14.8 inches in 7 days can be expected at Paducah about once in 1,000 years, and the 2-day rainfall of 9.2 inches can be expected about once in 250 years. Regardless of the statistical estimates of occurrence, the March storm was a big and unusual rainfall. Although the amount varied

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Flooded feedlot on West Fork of White River, Iindiana.

from place to place, it provided a severe test to some 70 small watershed projects in 9 States.

Reports are still being received on the functioning of SCS-designed structures throughout the storm area. Some emergency spillways needed maintenance work after the runoff subsided, but there was no indication that any dam was overtopped. The maximum water level in one structure in Kentucky, however, came within 0.2 foot of the top of the dam.

Even though rains of higher intensity may create greater flood peaks, the storm of March 3-10 provided a good test of SCS hydrologic design. It indicated that present criteria are adequate but that any design level below the current minimum for each class of structure would be subject to question. The rainfall at Paducah, exceptional as it was, was well below the minimum design capacity of the structures. For example, "class a" structures to protect remote agricultural land of low value will pass runoff from 7.8 inches of rainfall in 6 hours, and "class c" structures above residences and important public utilities will handle runoff from 28 inches of rainfall in 6 hours. These capacities far exceed the 5.7 inches that fell in 24 hours on March 9, and the "class c" structures have double the capacity needed for the 14.8 inches of the entire 7-day storm.

Since it is not economical to provide complete protection from such unusual storms, the runoff is bypassed through emergency spillways. This does not mean that there will be no damage in watershed projects, but that flooding is held to a minimum consistent with the economics of each situation. The emergency spillways are needed only for rare occasions and generally need some maintenance after being used.

Small watershed projects are not designed to prevent floods on major rivers such as the Ohio. Although they may reduce damages on the larger rivers, their primary purpose is to give a specified degree of protection to certain areas within the tributary watersheds. Where the endangered land is in pasture or similar agricultural use, only a low level of flood protection is justified. Where high-value agricultural land and crops are involved or urban communities are affected, a much higher degree of protection is provided. Even if the majority of the tributary watersheds of a major river were protected by small watershed projects, the runoff bypassed by emergency spillways might be expected to result in some flooding on the main stem after such exceptional storms as that of last March.

To date the full story of the effectiveness of the 70 small watershed projects in reducing flood damage during the period March 3 to 10 is not known. Information is being collected, however, which will contribute much to the store of hydrologic and other related data in planning future projects.

Land Improvement Contractors Bring New Know-how to Conservation Work

By Leonard Morris

CONSERVATION contractors, a new breed of builders and doers, are important in getting conservation work done. They cooperate with soil conservation districts and the Soil Conservation Service to form a sort of conservation triad that has done much for the spread of engineered soil and water conservation construction.

Before World War II conservation practices on farms in the United States fell largely in the "do it yourself" category. A bumper crop of leaflets appeared with instructions on such things as building terraces with "your own moldboard plow." In those days the slip scraper and the "tumblebug" were used to install practices requiring earthwork.

After the war the demand for installation of carefully planned and designed soil and water conservation construction gave rise to the soil conservation contractor to build terraces, install draintile, construct dams, or apply other conservation measures.

As the conservation concept spread, the growing corps of conservation contractors became aware of a need for greater know-how and skill in the art of land improvement. They sought to fulfill this need for professional training by organizing into district and State groups. Their purpose . . . "to sponsor schools which would help them become professional land improvement contractors.

Out of this developed the Land Improvement Contractors of America with affiliates in 15 States and Canada. Their objectives embrace advancement of responsible administration of soil and water conservation programs, high quality workmanship, and professional competence.

Land and water contracting today is a $1 billion business. It offers a solution to many of the problems of farmers and other landowners. It contributes to the economy in areas of construction and it increases production of plants which manufacture machines and equipment used in conservation construction.

Conservation contractors have been a sort of catalyst in this economic mixing bowl. Their quest for professionalism will make theirs an ever important role in the continuing task of saving more soil and water for use in the Nation's growing economy.

The author is president, Land Improvement Contractors of America, Corning, Iowa.

Water Leveling Louisiana Riceland Saves Labor and Irrigation Water

By K. V. Stewart, Jr.

RICELAND in the coastal prairie section of southwestern Louisiana can be leveled successfully when the land is flooded with water if the soil is of sufficient strength to support mechanical earthmoving equipment when the top 4 to 6 inches is saturated. This method has been successful on the Crowley, La., Rice Experiment Station and is now generally known in the rice area as "water leveling" riceland.

The land-leveling method does not require surveying, since the water acts as a natural level. And the method is well adapted to southwestern Louisiana because of the high annual rainfall, most of which falls during the time when the land would be available for smoothing or leveling.

Most of the rice area in southwestern Louisiana has a natural or artificial hardpan 8 to 12 inches under the soil surface, which permits the operation of rice farm tractor-mounted graders and levelers when the land is flooded. Crowley and Midland silt loams naturally have hardpans that make water leveling feasible. Other soils may have too high a clay content to support mechanical earthmoving equipment, and some areas have topsoil too shallow to permit the depths of cut required.

Using the results of the Crowley experiments and working with soil conservation district cooperators, the Soil Conservation Service has developed standards and specifications for water leveling.

The usual survey procedure is to eliminate every other old contour levee, or retain one of every 3, 4, or 5 old levees, and realine the remaining key contour levees. Key levees are laid out as smooth curves, or are run straight without curves, depending on the topography.

Farmers like the resulting fields because they have fewer levees to take up space and reduce rice yields. Levees also are a source of grass seed infestation for the rest of the field. Fewer levees require less labor in flooding and flushing operations.

In the leveling procedure the soil is worked into a loose seed bed with turning plows and disk harrows. The entire area between the levees is then flooded to completely saturate the soil. The soil under water is moved from the higher to the lower parts of the area.

An SCS study of two fields which had been water leveled in the Acadia Soil Conservation District showed that proper water leveling can greatly reduce the number and length of contour levees. Cooperator Lyle Fogleman reduced the number of levees on his farm from 11 to 3 and the length of the levees from 8,350 to

The author is State conservation engineer, Soil Conservation Service, Alexandria, La.

Water serves as a natural level for tractor operators smoothing land in ricefield.

3,000 feet. Floyd Richard reduced the number of levees on his farm from 17 to 3 and the length from 15,150 to 3,850 feet.

Water-leveled fields also generally require less water for flooding. The U. S. Department of Agriculture reported 429,530 acres of rice harvested in southwestern Louisiana in 1959. If all this area could be water-leveled and the average water requirement reduced by 10 percent, it is estimated that the total saving would amount to about 23 billion gallons a year. In actual practice the amount of water saved varies considerably, depending upon topoggraphy, the efficiency of the old irrigation system, and the planning of the new system. In some cases there may be little or no saving of water.

Water leveling is becoming popular with rice farmers. In the Acadia district alone, the SCS helped district cooperators lay out new levee systems on 2,500 acres of land during the past 2 years.

Cost-sharing for water leveling riceland is now being provided under the Agricultural Conservation Program on land which had not previously been smoothed under the ACP.

Horace Arceneaux, chairman of the State ASC Committee, says:

"I think water leveling is a completion job on land that has previously been smoothed. There is no doubt it is a big help in the prevention of erosion. It is also an improved water conservation practice. Water leveling, compared to land smoothing, is like comparing a good concrete highway to the old time gravel road."

M. W. Scanlan, Jr., chairman of the Acadia district, says:

"All you have to do to see how this practice is catching on is take a plane ride from Crowley to Lake Charles."

Fogleman, president of the Acadia Paris Cattlemen's Association, says, "I think enough of it that I plan to level all the land I operate within the next 3 years."

Causby Hamic, Jr., rice and cattle farmer, says:

"It pays to water level just for the amount of labor saved in flooding the fields and the time it takes to check the field. The first field I leveled, we eliminated more than 15,000 feet of levees."

Basin Irrigation System Stops High Pumping Costs

By John Colvin, Jr.

HIGH pumping costs used to make it "tough" for Arizona Farmer Jay Wilson to grow crops on his ranch in Casa Grande.

Now a newly installed basin irrigation system permits him to cover 140 acres instead of 100 with the same amount of water —a 40 percent increase in irrigation coverage at the same cost.

Wilson talked things over with technicians of the Soil Conservation Service, working through the West Pinal Soil Conservation District, and also made application for Agricultural Conservation Program cost-sharing funds in order to level some of his farm.

This matter of irrigation on flat land or sloping land had puzzled Wilson for some time.

Flat fields required less water and made as much or more cotton in almost every case. Twenty-five percent more water was used on the slopes.

After getting information such as this from field trials, he set up a system that required less water to get the job done.

Wilson "bench-leveled" his farm, which required cutting quarter mile runs to an eighth of a mile and taking out the sidefall so he could basin-irrigate the fields.

Some folks said it would cost

Aerial view of water-leveled field beside winding contour dikes of unimproved system to right.

The author is soil conservationist, Soil Conservation Service, Yuma, Ariz.

too much to farm the small patches and more fields would be needed.

There were advantages to long runs, but there was the problem of getting the most from his water on those big fields. Shorter fields saved water. Benching meant less dirt to move, shallower cuts, and shorter, less expensive hauling.

SCS engineers planned a 40-acre field with about 0.1 foot fall per 100 feet that would result in a sloping field with a long run. This work called for moving about 23,000 cubic yards of dirt.

The field was also figured in two 20-acre blocks with 0.2 foot total end fall in runs of 660 feet without sidefall. The shallower cuts of this plan required less than 19,000 yards to be moved. The plan included one-fourth mile of ditch to control water over the irrigation run. This is the plan he installed.

When the job was done on the short runs, Wilson planted sudangrass to get humus into the soil and provide pasture for cattle.

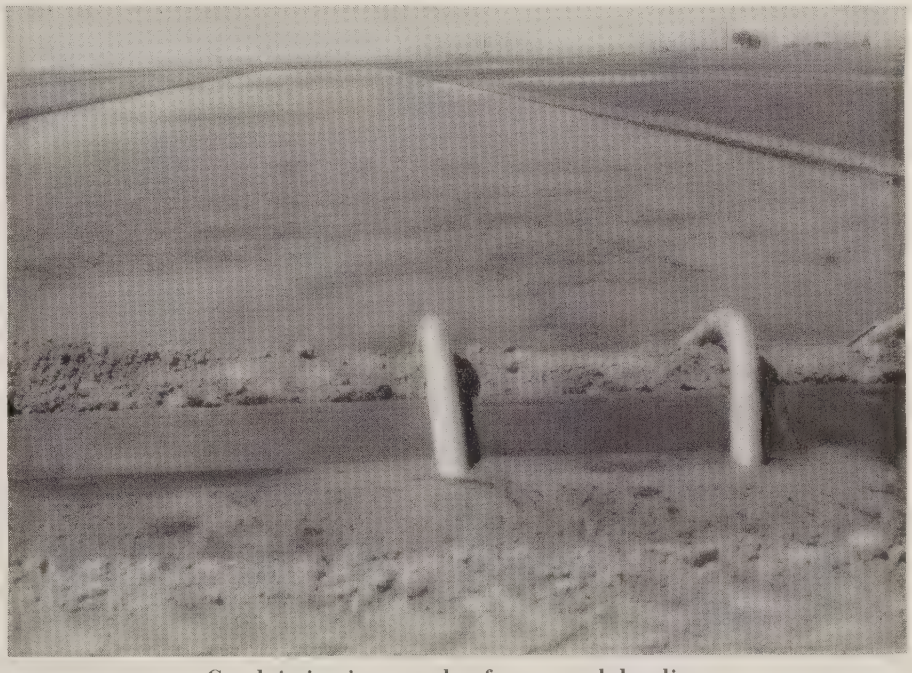
Irrigations were different than any he had tried. He moved four or five big siphons about 50 feet every hour. No water ran off the end of the field, and there were no dry spots or holes to shovel water in or out.

What made Wilson smile—when water was put on, it stayed. By putting his 1,350 gallon per minute head onto one ¼-acre border, he could get the water to the end of the field in about 15 to 20 minutes, and then let it fill the border to the desired depth. This usually took about 45 minutes more and resulted in an application of about 4 acre-inches. Water was 2 or 3 inches deep when he changed it, and it disappeared in about an hour's time.

No question where it went. No water got out of the field except down through it.

He determined how much water was needed at irrigating time by estimating available moisture in the root zone, and then irrigating enough to fill the soil to capacity.

Water runs off where slope is too steep and run too long.



Good irrigation results from good leveling.

The rate at which he covered a border allowed exposed ground surface an equal chance to absorb water. Penetration was about the same on the entire border.

The whole border or field was treated as a unit rather than trying to "irrigate to suit the dry zone" and ending up with more water on the upper end than needed or running tailwater off the lower end.

Wilson planted a green manure crop of barley in the fall and pastured it four times before the cold weather stopped the growth and the field was put into cotton. Water used on the barley was about 30 inches, going into the soil uniformly.

Wilson sums it up like this:

Water is limited and expensive in the Casa Grande area and must be conserved.

Wilson is doing just that.

"Watershed Philosophy" Spreads Along Hadley Creek and Beyond

By Hampton H. Long

A "WATERSHED philosophy" akin to that of "soil stewardship" distinguishes the thinking these days of people living along Hadley Creek in Illinois' westernmost Adams and Pike counties.

When the Hadley Creek watershed project was first started in 1955, very little conservation work had been done on the 46,000 acres. On some fields one-quarter to one-half of the topsoil had been lost. The work that had been done was on an individual basis.

Hadley Creek was one of the 60 pilot watershed projects in the United States authorized by Congress back in 1954. As the work progressed, a watershed philosophy developed among the people living on the watershed. People began to take pride in the amount of total conservation applied in the watershed and on their own farms. They began to see the advantages of working together.

Dewey Andrews, dairy farmer, says, "I feel that the dividends we farmers receive from the project will continue to come in as long as we are willing to follow the conservation practices that go hand-in-hand with the major structures.

The Federal Government, through the Soil Conservation Service, helped pay for the construction of the larger structures that usually benefited at least 3, and sometimes as many as 10, farms. They reduced floodwater and stabilized gullies. Henry Shuster, who lives one-half mile below the largest dam in the watershed, says, "I didn't see how that dam could do much good; but, do you know, since it was built I've never seen the time I couldn't wade across the creek with knee boots on? We've had some awful rains, too. Before, we could expect the water to come clear up to our yard fence."

Schuster was talking about a dam that held back floodwater from 7,000 acres and let it out through a 36-inch pipe so slowly that there was no flooding.

In the uplands behind the structures, the people worked together in cooperation with the Adams County and Pike County soil conservation districts to apply terraces, trees, ponds, small structures, contour farming, and other conservation measures necessary to reduce soil and water loss. They built 190 miles of terraces, planted 60 acres of trees, contoured 6,000 acres of cropland, improved 2,000 acres of pastures, and devoted 536 acres to wildlife cover. Fishing is excellent in the 200 lakes and ponds. Rabbits, quail, and deer are on the increase.

The people in Hadley are proud of their accomplishments and they should be. They have the satisfaction of people working together to solve the flooding and erosion problems. They acquired the "watershed philosophy," the knowledge that conservation practices applied on a watershed basis benefit all. This philosophy has spread to other people and other areas.

Today, within 50 miles of Hadley Creek, five other watershed projects are either in operation or are being planned. Big Blue Creek near Pittsfield, Ill., is a water supply for the town, and Hambaugh-Martin near Versailles protects bottom land from flooding. Plans are being prepared for North Fork of McKee Creek and Middle and South Forks near Mt. Sterling, and an application has been submitted for the Coal and Crane creeks near Rushville, Ill.

As Mrs. Webster Sykes of Barry says, "This Hadley Creek project is the best thing that ever hit this community."

Stripcropping protects the uplands in the Hadley Creek watershed, Illinois.

The author is area conservationist, Soil Conservation Service, Macomb, Ill.

The completed land-leveling job is checked by soil conservation technicians on E. I. Stamford farm.

Land Grading Raises Yields And Benefits Rural Economy

By Robert H. Landers

FARMERS, soil conservationists, and soil and water conservation district supervisors in southeast Missouri are placing more emphasis on good land preparation in a well balanced soil and water conservation program.

In this area of deep fertile soil, high annual rainfall but frequent summer drought, and flat topography, land grading is needed for the dual purpose of removing excess water and efficient distribution of irrigation water.

Land grading is an exacting earthmoving job that must be carefully planned and installed with meticulous attention to every detail by the landowner, the contractor, and the Soil Conservation Service technicians who provide the plans and check the completed work.

R. B. McCord and his operator, William Fortner, are good examples of working by a basic farm conservation plan. The two men became cooperators with the New Madrid County Soil and Water Conservation District in 1956. Their 640-acre farm is located near Tallipoosa, Mo.

Preliminary work before grading began with a soil survey and topographic survey of the farm by the SCS. After these surveys, the basic farm conservation plan was prepared and the SCS engineer provided the cooperators with detailed grading plans as the work progressed. These plans were based on engineering surveys made on a 100-by-100-foot grid from which a design sheet was prepared. The "cut" sheet furnished the farmer or his contractor showed cut and fill, amount of earth to be moved, required grades to be used, location of surface drainage ditches, and existing field ditches to be eliminated. Special detailed soil surveys were used as needed to base designs on properties of the soil, such as infiltration rate, that govern length of runs and slopes of rows.

McCord and Fortner's plan showed a need for 6 miles of drainage ditches, both mains and laterals, and the grading of 600 acres for drainage and irrigation. Fourteen irrigation wells were located. When completed, they ranged in depth from 45 to 75 feet and produced an average of 450 gallons of water per minute per well.

McCord and Fortner, since starting on the plan in 1957, have constructed 26,780 linear feet of ditches and have graded 625 acres. They moved 165,000 cubic yards of earth, all with their own equipment, which includes a 6½-yard scraper and a 45-foot leveler. They installed 2,000 feet of 6-inch and 1,300 feet of 5-inch aluminum gated pipe and 3,000 feet of flexible rubber tubing. These along with eight small portable irrigation pumps fulfill water and irrigation equipment needs.

Charles Meunier, SCS work unit conservationist, and E. B. Nace, associate director of the Missouri Agricultural Extension Service, have worked closely with the cooperators on their soil fertility program, as have commercial fertilizer and irrigation specialists. The rotation after land preparation is 2 years of corn, 1 year

Work Unit Conservationist Charles Meunier finds proof of value of land grading on McCord-Fortner farm.

The author is agricultural engineer, Soil Conservation Service, Cape Girardeau, Mo.

of cotton, 1 year of beans, then back to corn. They seed 320 acres of rye and vetch for cover crops each fall, to be plowed under the following spring for green manure.

A complete record system was worked out by the Missouri Extension Service, which proved valuable in showing the operators the gains in per-acre yields resulting from the land preparation and improved soil management.

In 1963, Missouri farmers cooperated on land preparation with eight soil and water conservation districts in the greater Mississippi River alluvial basin area of southeast Missouri where a million acres could be improved by this conservation practice.

Two hundred and eighty-two farmers made plans and the SCS gave planning assistance and provided engineering designs for 336 jobs, requiring the moving of 3,604,368 cubic yards of earth and 42,198 feet of corrugated metal and irrigation supply line pipe at an estimated cost of $801,517.

Cost of land grading in this area ranges from $25 to $100, with an average of about $50, per acre. The amount of earthmoving required ranges from 150 to 600 cubic yards per acre.

This work uses many kinds of equipment and structural items. It not only improves farmers' and contractors' incomes but also helps others allied with farming and construction. For example, the petroleum industry, machinery and equipment manufacturers and dealers, the fertilizer and chemical business, well drillers, pumping and irrigation equipment manufacturers, and labor all play a part and share in the benefits.

Many of the larger landowners, such as R. B. McCord, own their own special equipment. Farmers in southeast Missouri, according to one equipment distributor, have purchased 25 sets of tandem scrapers (4- and 5-yard capacity) and 12 landplanes from his company alone this year.

Elementary Teaching Students Tie Conservation to Subjects

By John M. Cross

A JUNIOR class in elementary education at the University of Southwestern Louisiana developed its own plan for teaching about soil conservation and related resource problems by tying it to subjects taught in the State's upper elementary grades.

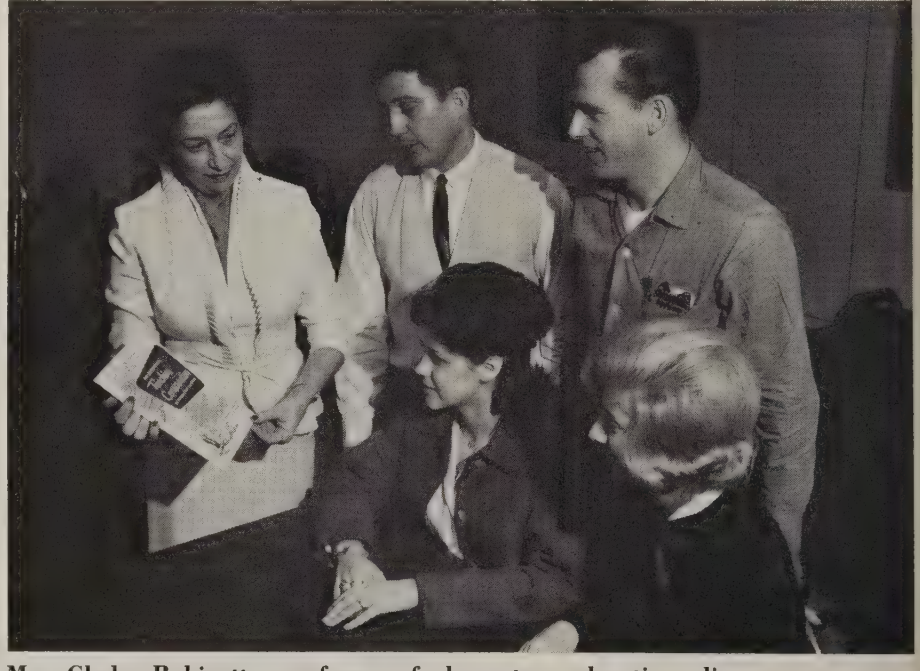
Under leadership of Mrs. Gladys Robinette, professor of elementary education, several objectives were set forth by the class in the beginning. This one basic objective was to develop understanding, awareness of, location, importance, and the benefits of natural resources. Improvement of habits and providing opportunities to develop skills in conservation by the children were included. The very approach to the subject, defined beforehand as "conservation is wise use," was a study in itself.

The class, one in teaching methods, divided into groups. Each group selected one area of study —soil, water, forests, grassland, seafoods, minerals, or wildlife— and outlined its course of action. To orient their thinking on the grade level and keep it simple and direct, the students asked themselves:

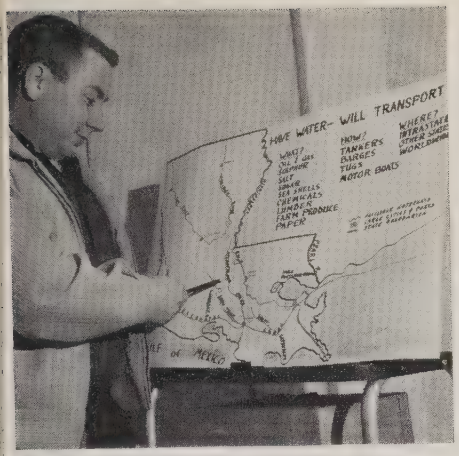
"What would I need to know about conservation if I were an eighth grade student?" Even their sources of information were confined to those available at local levels.

They evaluated each source of information on conservation with a critical eye. They looked into publications of the Soil Conserva-

The author is assistant State soil conservationist, Soil Conservation Service, Alexandria, La.



Mrs. Gladys Robinette, professor of elementary education, discusses conservation outline with members of class: Clifford Broussard, Lloyd Frith, Lois Daigle, and Carolyn Faulk.



Ryan Fontenot explains Louisiana water resources.

Class member Lois Daigle uses teaching outline.

tion Service and other agencies. They viewed films from the University library. Elizabeth Kaack of Baton Rouge, visited the local headquarters of the Grand Coteau Ridge Soil Conservation District.

Diana Domingue of Erath made a simple drawing showing how soil is formed. Ryan Fontenot made a map showing the importance of rivers to the welfare of Louisiana. "Demons of Erosion" was the subject of an example poster made by Kathryn Pesson, a student from New Iberia. These all were activities they likely would ask eighth graders to do.

Each group shared its findings with the entire class, and all the information was recorded for reproduction. Not only did the students learn methods of teaching in the course, but they also gathered much information about conservation of natural resources.

As a result, they will be prepared to handle the course in natural resources conservation taught in the junior high schools of Louisiana, and also to relate conservation to many conventional school subjects, such as social studies, mathematics, history, and language arts.

Mrs. Robinette, who is secretary to the Louisiana Advisory Committee on Conservation and Resource Use Education of the State Department of Education, thinks conservation should be taught, not just accidentally or incidentally, but systematically by relating it to subjects taught. That is what the "Education 327" class at Lafayette is prepared to do.

Electronic Surveying In Watershed Projects

The traditional rod and chain method of surveying can be beaten two to one by using a newly perfected two-unit portable electronic measuring device that has undergone nearly a year of field tests by the Soil Conservation Service.

The SCS Cartographic Division has found the instruments to be especially useful over rough terrain and around bodies of water, which are extremely difficult to chain. The units have been used primarily in widely scattered upstream watershed projects where immediate topographic maps are needed.

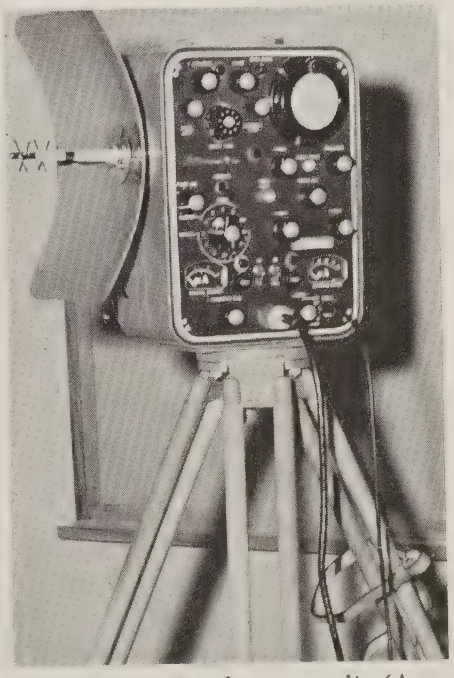
The new device measures in billionths of a second the time it takes a radio micro-wave to travel from one unit to the other and back again. This time lag is registered on a dial on the master unit and then converted to feet or meters. The instruments establish the horizontal and vertical control needed for the construction of topographic maps from aerial photographs.

The 25-pound units are powered by a 12-volt storage battery or a self-contained power pack. Operators of the two units communicate via built-in radio telephones or walkie-talkies.

The radio waves can penetrate a light stand of trees or brush, but they cannot shoot through a hill or thick forest. Measurements may be made through haze, mist, clouds, or light rain, day or night. Corrections and computations that have to be made are reduced to a matter of minutes by the new instruments, instead of hours required when the chain method of surveying is used.

A survey of 60 courses in 10 widely scattered watershed projects in Virginia took 14 days, including traveling time. It would have taken at least four times as long to get the measurements by chaining. In another test, in west Texas, the instruments in 2 weeks got readings that would have taken 4 to 5 weeks with conventional equipment.

The instruments were developed primarily for long-range measurements of 40 miles or more, and are correct to within a few inches even up to such distances.



The tellurometer for one unit. (Auxiliary equipment not shown.)

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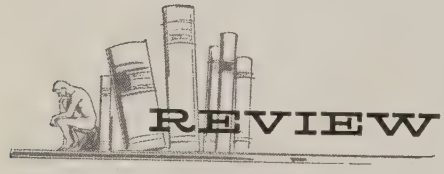

THE CARE OF THE EARTH. By Russell Lord. 480 pp. 1962. Thomas Nelson & Sons, New York. $7.50.

Without spelling it out in so many words "The Care of the Earth" is a relation of man's stewardship of the soil from earliest times to the present.

It is not a conservation book per se but, as its subtitle makes plain, "A History of Husbandry," the author's announced aim of which is "to outline the history of agriculture through advancing frames of time." However, figuring prominently in the step-by-step telling are soil and water conservation problems, programs, and advancements in the United States since the historic governors' conference on conservation called by President Theodore Roosevelt in 1908.

As the framework for spanning 72 centuries in his 480-page narrative, Lord revives the time lapse projection he advanced as an imaginary motion picture film in the Soil Conservation Service's first national bulletin, "To Hold This Soil," in 1938—24 years of change in a second, 1,440 years in a minute, 86,400 years in a year. The soil stewardship concept is reflected particularly in a number of references to and quotations from the Bible. As the book points out:

"The authors of the Bible, in their time, learned a great deal about the vital relationships of soil, rain, and man, and learned it the hard way. If the sequences of their racial experience are arrayed in the order of causes and consequences, no other single book contains as vivid a record of promised plenty followed by dispossession and despair."

By New Testament times, it is pointed out, conditions had changed; "and there had been by that time, unquestionably, . . . a diminution in the soil."

Drawing liberally upon the findings of contemporary and earlier conservation authorities in confirmation of what has happened to America's and the world's land and water resources, Lord draws this terse conclusion: "The problem of preserving the soil is still with us, and must be solved if modern civilizations are to survive."

Although much of the veteran conservation writer-editor's presentation has a familiar ring to his long-time readers, he has, with considerable skill, brought the highlights of trends in soil and water use and problems up to date with respect to growing urbanization and other aspects that today are broadening the conservation approach. He asks, for example: "What happens when a native rural population runs thin on soil and low in money in their home part of this land and starts to peddle their climate, cool or warm as the case may be, the remnants of their unspoiled pastoral or woodland calm and scenery, and such charms as remain in their historic rural traditions and landmarks to the urban swarm?"

All in all, Russ Lord has put on paper a collection of facts and documented references that make "The Care of the Earth" a particularly helpful volume for younger conservationists and a refresher source for the old timers in this field.

FRANK B. HARPER

◆

"We are standing at a point in time, at a place in the history of the world, when the very wisest use of our natural resources for the benefit of the whole free world is basic to the survival of human freedom—and on this depends the future of mankind on this earth."

—WILLIAM R. VAN DERSAL

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"To keep the farm land out of the river and the river out of the farm land is the immediate objective of all treatment involving bank protection on the upper Gila River. . . In those early days it was believed also that steel and concrete were the only effective materials which would successfully combat and remain to combat the river. Later, re-vegetation of the channel banks was admitted into the picture. Revegetation, with a minimum of structural, mechanical protection, is the generally accepted solution today."

COVER PICTURE—A soil conservation technician views aerial photographs through a stereoscope as he makes a land treatment plan. In such ways as this, modern surveying and mapping procedures speed the work of today's conservation workers.—Photo by Justus V. Baum, Jr.

VOL. XXIX, NO. 12 JULY 1964

CONTENTS

Page

267 Conservation Technology
by Donald A. Williams

268 Crownvetch Rewards Skill, Care in District Seed Plot
By George P. Thorburn and Virgil B. Hawk

269 Conservationists Find Way to Irrigate Saline Soils
By Edward E. Thomas

271 Carrying Capacity for Recreation
By Frank C. Edminster

273 Electronic Computers in Planning for Watershed Protection
By H. O. Ogrosky

274 Revised Programs Show Role of Districts in Conservation
By John W. Barnard

276 Rice Irrigation Reservoirs Help Meet New Water Needs
By William B. Davey

279 Is Your Dam a Bargain?
By H. L. Cappleman

281 Watershed Research Seeks Ways to Improve Planning
By L. L. Kelly

283 Conservation Saves Water in Drought Counties
By Clyde W. Larsen

284 Minnow Farming Expands as Land Use
By Roy A. Grizzell, Jr.

285 Large Watershed Dam to Provide Recreation Area
By John M. Cross

286 'Step Dam' Builds Self and Stops Gully
By Bill Phillips

287 Trees Against the Wind
By David W. Despain

288 Reviews

Soil Conservation

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BEN O. OSBORN, Editor

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Conservation Technology

Modern Methods Keep Pace With Today's Fast-Changing Agriculture

By Donald A. Williams

ANY scientific program—soil and water conservation included—is only as sound as the technology on which it is based. Effective technology is fluid, because the conditions and needs of a program are constantly changing.

Agriculture especially is in a rapid state of change. Larger farms, increased mechanization, more emphasis on management skills, and shifting of farmland to nonagricultural uses all call for increased and redirected technical skills.

Today's fast-moving soil and water conservation movement has a firm foundation of conservation technology. Land owners and operators, contractors, and Soil Conservation Service and Agricultural Research Service specialists continue to devise and try out new, improved conservation techniques.

Refinements being made in terracing are one example of steadily advancing technology. Farmers and the conservationists and researchers assisting them are modernizing terrace design, construction, and use to increase the benefits of terracing while eliminating its drawbacks. Parallel and "push-up" terracing systems have resulted that eliminate the bothersome point rows and uneven and inadequate spacing that made terraces difficult to farm.

These improvements, in combination with increased know-how in related cropping systems—minimum tillage, crop-residue mulches, soil-improving rotations—are allowing more efficient, profitable farming and more effectively reducing runoff and erosion.

Improved techniques in classification and interpretation of soils are enabling us to get a better picture faster of our Nation's soils. The information is being used increasingly to prevent costly land use mistakes both in and out of agriculture.

Constant improvements are being made in the machines that do all kinds of conservation jobs—tree planting, ditch lining, and earthmoving for many purposes. More powerful modern equipment has made possible a rapid increase in earthmoving.

Improvements in design and installation of structures for erosion control and flood prevention are resulting in better, safer structures at lower cost.

Better plant materials are being developed, along with better skills for adapting, planting, and maintaining the stock used.

Technological improvements are useless, however, unless they are put on the land. How quickly a soil conservation district adapts soil conservation measures to new technology is a reflection of the modernism or archaism of the conservationist assisting that district.

The Soil Conservation Service can be no better than the combined skills of its work unit people. They must use up-to-date methods and techniques and recommend up-to-date conservation treatments to cooperators. A terrace that fitted the land and farming operations of the days of the two-row cultivator is as out of place as a steam threshing rig in today's agriculture.

SCS is making a concerted effort to keep its conservationists up to date. It is placing new emphasis on their education and personal qualifications. It seeks new employees who are trained in fields such as outdoor recreation, wildlife management, forestry, and range management. Also, SCS seeks people who are able to deal effectively with both rural and urban people.

SCS employees are urged to get further academic training while on the job. An encouraging number receive advanced degrees each year. The SCS also works with colleges and universities in revising their curriculums to keep pace with the needs of modern conservationists.

Qualifications, training, and technical standards are only guides, however. In final analysis it is the ingenuity and enthusiasm with which the local conservationist adapts new developments and techniques to local problems and situations that gets modern conservation on the land. These qualities must be encouraged; we need a 1964 program in 1964.

Resource protection and development will continue to depend upon a sound, improving technology. Increasing interdependence of urban and rural people and the pressing needs for better economic opportunities for rural communities call for resource development on a still broader scale in the future. We must keep our technology moving to match it.

Crownvetch Rewards Skill, Care in District Seed Plot

By George P. Thorburn and Virgil B. Hawk

A YIELD of 466 pounds of clean seed per acre of a new plant—Emerald crownvetch—was like a gold strike for the Keokuk County Farm in southeastern Iowa in 1963.

The yield was from the Keokuk County Soil Conservation District seed increase field, which is the latest addition to conservation activities of the county farm. This farm has become a model for outstanding results in soil and water conservation under the guidance of Martin Holm, custodian, and John Anderson, farm operator.

After a new plant, such as Emerald crownvetch, has been thoroughly tested and has proved its worth under field conditions, the next step is to produce seed for wide use.

In spring of 1961, the Soil Conservation Service furnished 20 pounds of foundation seed of Emerald crownvetch to the Keokuk County district from production at the Elsberry Plant Materials Center. A seed increase agreement was set up between the district and the Keokuk County Board of Supervisors who operate the county farm under a conservation farm plan.

Mixture of Emerald crownvetch unhulled seed and a large bulk of green leaves obtained by direct combine harvest in 1962.

Under supervision of SCS technicians, the seed was treated with a fungicide, inoculated, and broadcast with a hand seeder on a 1-acre field of Clinton silt loam in April 1961. The seedbed was on cornstalk ground with a heavy residue which was tandem disked four times. Fertilizer was broadcast and the seed covered by a double harrowing. Weed control measures were applied, including a post-emergence herbicide to eliminate annual grasses.

The stand obtained the first year appeared to be quite thin and spotty, possibly because of the bunches of cornstalk residue.

In 1962, since the growth was not heavy or thick, a direct combine harvest was tried and the unhulled seed and green leaves obtained were carefully dried to prevent spoilage. Only 19 pounds of clean seed was realized. The germination was 72 percent, including hard seed, but many seeds were shriveled and immature.

In 1963, plant growth and seed production on the original acre were excellent. The ground was completely covered by plants that reached a height of about 4 feet and were a mass of pinkish blooms. Like birdsfoot trefoil, Emerald crownvetch blooms, forms pods, and matures seed continuously for several weeks. Its pods, when ripe, become dry and brittle and break off easily. They do not pop open like birdsfoot trefoil, but break into sections between the seeds.

Late in July, the crownvetch was mowed and laid out in windrows. Since ripe pods break off easily, handling of the material had to be kept to a minimum. After drying for 5 days, it was threshed with a combine with pickup attachment. This resulted in seed free from green leaves and dry enough to be stored. After hulling, scarifying, and cleaning, the yield was 466 pounds of seed with a purity of 99.59 percent, no noxious weeds, and a germination test of 88 percent, including 40 percent hard seed and 5 percent firm seed. This is a higher test than required for certified crownvetch seed.

George Thorburn checks the Keokuk County SCD seed increase field of Emerald crownvetch at the late bloom stage in 1963.

The district's share of the seed will be used to establish new seed increase fields in the Keokuk and Lee County soil conservation districts. The balance is being sold to district cooperators and highway erosion control contractors throughout Iowa for the stabilization of steep banks and critical erosion areas.

There is interest in the formation of an Emerald Crownvetch Seed Growers Association to foster stable supplies and marketing. In western Iowa, where birdsfoot trefoil may not be well adapted, there is interest in using crownvetch for pasture seedings.

The authors are work unit conservationist, Sigourney, and plant materials technician, Ames, both of the Soil Conservation Service, Iowa.

Conservationists Find Way to Irrigate Saline Soils to Grow Pasture Grasses

By Edward E. Thomas

DESERT, desperation, and despair.

So might the uninitiated tourist speeding along transcontinental highway US-80 in Trans-Pecos Texas view the flat, salt-laden countryside.

But farmers who understand the natural limitations of the area and use the information available to them from the Soil Conservation Service about soil-water-plant relationships can achieve success and satisfaction in the use of these difficult soils.

Such a farmer is James P. Goode, 2 miles west of Barstow in the Upper Pecos Soil Conservation District. After years of irrigating crops with the salty water available in the area, his fields had become so salty that even weed seeds refused to sprout and grow. SCS conservationists assisting the district helped him plan an irrigation and soil-management system that enabled him to establish bermudagrass on his cropland and provide needed grazing for his livestock.

Goode's problems were those normally encountered in desert regions: (1) The annual rainfall is less than 10 inches, making irrigation necessary for crop production; (2) soils contain much salt harmful to crop production; (3) irrigation water also contains harmful salts; (4) high temperatures and high salt content cause the fine-textured soils to form surface crusts that restrict plant emergence; and (5) the application of salty irrigation water builds increasing concentrations of salts harmful to crops.

An efficient plan for conservation irrigation of saline soils such as exist in the western part of the United States must take into account three major factors: (1) The salt tolerance of the crop to be grown; (2) the salinity of the irrigation water; and (3) the physical properties of the soil that permit or inhibit the necessary salinity balance for profitable crop production.

In order to appraise Goode's problems and opportunities, the SCS had to (1) map the soils on the farm, (2) determine the water-holding capacity, permeability, and other physical properties of the soil, (3) check the salt content of the soil and of the irrigation water, and (4) appraise the existing irrigation system and current methods of watering the crops.

The soil survey indicated that these were problem soils, especially with regard to movement of air and water.

The degree of salinity was determined in the field with a solubridge, an instrument that measures the electrical conductivity of the extract of soil samples saturated with distilled water. The results showed that it would be necessary to leach the soluble salts down and out of the root zone. Permeability measurements indicated that the soils could be leached. The gross irrigation water requirement for the crops to be grown, including that needed for leaching, was calculated.

This technical information was used to design and lay out a conservation irrigation system.

Goode's plan called for the orderly application of a combination of permanent and management-type practices. Goode entered into a Great Plains Conservation Program contract that provided financial assistance in applying some of the permanent con-

Conservation irrigation system makes possible good pasture on saline soil.

The author is area conservationist, Soil Conservation Service, Pecos, Tex.

Arno clay soil in the Pecos Valley contains high concentration of salts harmful to crops.

Salts rise to tops of lister ridges after irrigation; bermudagrass is planted in furrows where soil is less salty.

Coastal bermudagrass is spreading over crusted saline soil with aid of frequent irrigation to reduce salt.

servation practices.

The old irrigation system was reorganized by constructing stabilized earthen ditches, leveling 78 acres of land, and installing a level border irrigation system.

When the system was completed, the operator applied 18 inches of water to leach the soil of the accumulation of salts. He then sprigged the former cropland to Coastal bermudagrass, a salt-tolerant pasture grass. He irrigated the newly sprigged area on a 7-day schedule for 2 months until the grass was established. The short cycle of irigation was needed to keep the moisture content of the soil high, to continue to leach out salts, and to reduce soil crusting and enable the grass to cover the ground more quickly.

Anhydrous ammonia fertilizer was applied in the first application of irrigation water and monthly thereafter. By adequate fertilization, proper irrigation, and a lot of hard work, Goode had the once bare and lifeless soil producing again.

The success of Goode's operation has resulted in many benefits. Good grazing for the livestock enterprises is evident. The grass has formed an excellent ground cover which has doubled the efficiency of leaching by the irrigation water.

This experience is not a rarity as might be expected. Farmers in the Upper Pecos district are solving many old problems that result in the mutual benefit of neighboring landowners. Through the efficient management and proper use of soils, water, and plants, thousands of acres of problem soils are being made to contribute to the financial well being of the area.

Alaska Earthquake Damages Ranches on Kodiak Island

The Alaska earthquake caused serious damage to ranches on Kodiak Island but had little effect on the Matanuska and Tanana valleys and the Kenai farming areas, State Conservationist William B. Oliver reports.

Total damage to 12 Kodiak ranches was estimated at $250,000 to $300,000. About 200 head of cattle were lost. Three houses, 4 or 5 barns, and a slaughter house were destroyed.

The earthquake caused no change in plans for soil surveys in Alaska this summer.

Wildlife Aid To Suisun District

The Suisun Soil Conservation District and the California Department of Fish and Game have signed a memorandum of understanding which provides for technical services to the district for development and maintenance of fish, game, and other wildlife resources through the district's land and water management program.

A wildlife management technician has been assigned to the district 2 days a week.

Carrying Capacity for Recreation Applies Basic Ideas in New Setting

By Frank C. Edminster

PLANNING recreation use of land presents soil conservationists with new problems that challenge their ingenuity and call into play background knowledge in many scientific fields.

One aspect of recreation planning now gaining recognition is that there are limits to the number of people that can be provided recreation by any tract of land. Conservationists seeking to define these limits make use of two biological concepts familiar to soil conservationists—"carrying capacity" and "saturation point."

Soil conservationists have long used the concept of carrying capacity in a variety of forms. Productivity of rangeland and tame pastures and their ability to support livestock and wildlife are essential considerations in grazing management. In wildlife management, different habitats are evaluated as to the numbers of different kinds of game birds and animals they will support. In woodland management, we speak of "cords per acre per year" that a site produces—a variation of the carrying capacity idea.

The other concept called "saturation point" is less generally known. Simply stated, the saturation point of a population is the level that a species never exceeds regardless of the quality of its environment. For example, the breeding population of ruffed grouse, a woodland game bird, is never more than 25 birds per 100 acres. This limit is set by the character of the species itself, rather than of the environment. It is a social factor, a limit of tolerance to its own kind—a sort of *social* carrying capacity.

The ideas of carrying capacity and saturation point both are important in developing recreation areas. Conservationists assisting landowners and groups will need to take *human* carrying capacities into account just as they do for animals and plants on land in other uses. However, since *Homo sapiens* is both a gregarious and a greatly variable species, there are both great tolerances and strict limitations that must be considered.

Carrying capacity of recreation areas for people is not determined by food supplies or by shelter, as is generally true with wild creatures. It may be determined by soil conditions. More often, it is decided by safety factors or by the tolerances of people for people —the saturation point idea. Let us take a couple of examples to illustrate.

Cottages for vacationers are to be built around a new lake. Septic tanks will be used for waste disposal. The spacing of the cottages, and hence the number of vacationers, will depend on the ability of the soil to dispose of sewage. If the soil is only marginally suited for septic tanks, the cottages will have to be widely spaced and the carrying capacity of the area for vacationers is low. If the soil is very suitable for infiltrating water and waste, the cottages can be close together and the carrying capacity is high. However, depending upon the *kind* of clientele, the intolerance of the vacationers for others of their kind may interpose a stricter limit than soil. Thus, cottages might need to be spaced wider than soil conditions would allow to satisfy the desires of people. Here the *social* carrying capacity sets the limit.

As a second example, take a swimming beach and boating lake. Since swimming and boating are incompatible uses, the lake must be zoned and each portion will have its own carrying capacity for its use. In both cases, *safety* is a prime factor. If only rowboats are allowed, there may be several per acre of water. If powerboats and water skiing are permitted, only about 1 boat per 5 acres can be tolerated.

Many more swimmers than boaters can be accommodated on an acre of water and shore. A normal tolerance would be about 400 per acre of beach. This is based on an assumption that there is twice as much water for swimming as beach for lolling, and that 70 to 85 percent of the "swimmers" are on the beach at any time.

The amount of space devoted to different activities times the carrying capacities gives the peak load of people for each kind of area. These figures are the basis for planning facilities. The marina will be designed to hold the allowable number of boats, the bathhouse to accommodate the swimmers. The car-parking area will be designed to limit the attendance to the number of people that can be accommodated for all activities.

Thus, conservationists will apply the ideas of carrying capacity and saturation point in planning recreation land use just as they have in other kinds of land use planning.

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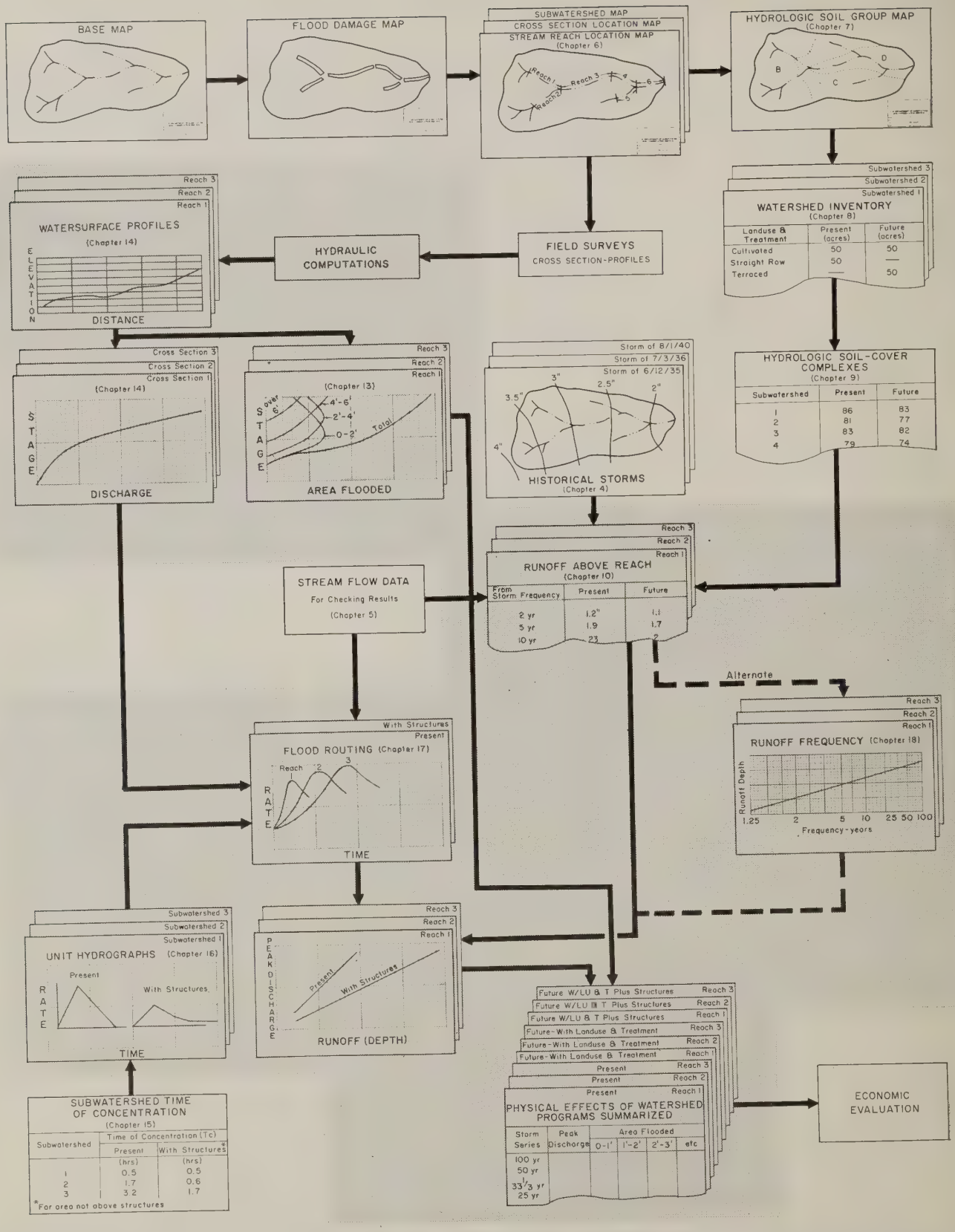

Hydrologic functions in planning a watershed project. This flow-chart indicates the scope and complexity of evaluating the physical features of a watershed and the effects of planned treatment. The steps in the shaded area can be performed by electronic computer in the program now being field tested. Most of the others are to obtain basic data required as input to the program.

Electronic Computers Join SCS Team In Planning for Watershed Protection

By H. O. Ogrosky

IT will take minutes for watershed planning specialists in the future to get information that formerly entailed weeks of tedious work. Why? The electronic computer is becoming a regular member of their team.

Soil Conservation Service engineers today are field testing the use of electronic computers in planning actual watersheds. The procedures now being used give quick answers to the crucial question of how much flood flows would be reduced by various combinations of channel works and floodwater-retarding structures. For a watershed with average conditions, after basic field data have been collected and programed according to standard instructions, the computer takes about 72 seconds to determine the effect of 18 retarding structures on the height of waterflow at 25 locations downstream after varying amounts of rainfall. The same computations performed manually might require a month or more of an engineer's time. The computer program can include data for as many as 60 structures and will compute the information for 120 locations on the stream.

The development of a watershed plan is a very complicated task. Planning specialists for each watershed must develop the most economical plan that will meet the objectives of the project sponsors. To do this they usually must prepare and evaluate several alternative plans. To determine which of the possible solutions is most economical, planners must consider many combinations of vegetative and structural controls. Although the planning team has wide latitude in devising plans, the end product must conform to a host of limitations.

There are natural or physical limitations, such as the climate and topography. There are legal limitations, such as the maximum allowable storage capacity of structures and the required benefit-cost relationship of the project. And there are limitations set by the amount of funds local sponsors can make available to carry out the work.

The use of computers makes it possible to get quantitative evaluations of many more combinations of measures than could be considered otherwise. The computer currently being used is capable of making 229,300 additions or subtractions per second. Certainly no practical team of human workers can match this. Information produced by the machine gives planners a wider choice in finding the plan that best fits the limitations of the project.

Machine computation, however, is not necessarily expected to reduce planning costs, but rather to produce better plans. The machine cost of making 10 evaluations on one watershed with varying rainfall volumes and durations and a varying number of structures and channel works is about $300. The time required to make this number of evaluations by manual calculation makes it impossible except for extremely critical or costly projects. The wider choice of alternatives offered by the use of computers results in a more efficient plan which in turn may reduce the overall cost of the project and make the watershed-protection dollar go farther.

An important feature of the SCS computer program is that field engineers can use it with very limited instructions. This is because both the input and output data are in a form and language familiar to them rather than in complicated code.

The full potential for the use of electronic computers to reduce the time of necessary mathematical work in conservation engineering cannot be realized at this time.

The evolution of the computer has been so fast that equipment often became obsolescent before it could be installed. Improvements are still being made, but it appears that the size and capacity of current models using tiny microcircuits should fulfill Service needs for some time to come.

It is quite safe to predict that SCS will find many additional uses for the new computers. The present computer program was designed to handle only the hydraulic and hydrologic aspects of watershed planning. It is, however, designed so that additional components of the planning process can be added to obtain a complete evaluation of proposed watershed projects in the future.

Scientists need not be worried about being replaced by computers in watershed planning. The machine must be fed reliable basic data if good results are to be obtained. Many kinds of basic data on physical conditions in a watershed must be obtained and the economic, social, and legal limitations of the project defined by competent professional workers before the computer can be programed to give its answers. It will make only the decisions that someone tells it to make. It is already clear, however, that computers can be used by SCS personnel to step up production and produce more reliable results.

The author is Chief, Hydrology Branch, Soil Conservation Service, Washington, D. C.

Revised Programs Show Expanding Role of Districts in Conservation

By John W. Barnard

MODERNIZED soil conservation district programs tell an exciting story of advancing technology and expanding concern for resource development and conservation in the 1960's.

Across the Nation more than 1,200 district governing bodies have responded to Secretary Orville L. Freeman's invitation in 1962 to update their working relations with the Department. They have revised their programs and signed new basic memorandums of understanding with the Department. The Soil Conservation Service in turn has revised its supplemental memorandum of understanding with each accordingly.

The new programs present an interesting story of progress, of thought and study, and of hard work. They show an increasing understanding of multiple use of land and water. They involve a widened range of assistance from local, State, and Federal agencies and private interests to carry forward conservation work according to local needs.

More and more conservation districts are finding that concepts of soil and water conservation have changed since they were organized. Increasing population with resulting shifts in demand for land—for agriculture, urban, recreation, and other uses—calls for adjustments in use and creates new needs for treatment.

Land and water problems are still among America's most important concerns. The new conservation district programs chart the course of action to solve these problems.

The conservation district movement is a distinctly American effort—possible only under our democratic way of life and the free institutions which can flourish under this system.

Programs developed 20 to 25 years ago, when districts were first organized, do not fully meet the needs of modern conservation. It is not enough, today, to stop erosion and control runoff. Modern conservation districts must recognize all phases of resource conservation — soil, water, vegetation, wildlife, and related resources. The reduction of floods and sedimentation damage and development of outdoor recreation are important segments of total conservation. And the place of conservation in rural areas development to provide additional employment opportunities is a prime consideration in many districts.

A review of a few of the new programs from different parts of the country reveals the expanding role of districts in the conservation, development, and use of our land, water, plant, wildlife, and outdoor recreation resources.

Jackson County District, Ark.

The Jackson County Soil and Water Conservation District supervisors revised and printed an attractive program in 1963. The original program was developed in 1945, and revised in 1950.

This county of 407,680 acres was originally a "soil conservation district," but now is a "soil and water conservation district." The 1945 census of agriculture showed 2,738 farms with an area of 287,927 acres; the 1960 census showed 1,235 farms with 349,000 acres. Between these dates, the average size of farm increased from 105 to 283 acres. Cotton and rice are the main types of farming. Population of the district in 1940 was 26,427; by 1960 it had declined to 22,843.

Experience of the supervisors and conservation needs information provided a basis for updating the program. The broad objectives of the original program still are applicable, but the need for income-producing recreation developments, treatment of land not in agricultural use, and group action to solve watersheds problems are important additions.

Middlesex District, Mass.

The Middlesex Soil Conservation District in northeastern Massachusetts was organized in 1947. Its total area is 530,560 acres. At that time it had a population of about 1 million and a diversified agriculture with 210,237 acres in farms. These farms sold over $22 million of products or one-fifth of the State total.

The primary objectives of the district as stated in the original program were to improve farm drainage and reorganize crop fields so as "to adapt them to the use of modern machinery." Except for isolated areas, erosion was considered a minor problem. Other needs included proper use of woodland and establishment of wildlife refuges.

Fifteen years later the population of the district had increased by a quarter of a million. The cropland acreage had dropped from 87,000 to 41,000 acres; it is expected to be down to 34,000 acres by 1975. There is still an intensive agriculture in the district but the supervisors recognize the need for a changing program

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to meet the changing conditions.

In 1963 the district had more than 1,000 cooperators and the needs for assistance were growing —but in new directions. The pressures from the Boston metropolitan area were putting more land into nonagricultural uses. Both public and private interests were increasing their holdings for income-producing recreation, speculative purposes, nonprofit recreation, club grounds, and institutional construction.

The enactment of a Town Conservation Commission Law and a broadened "Conservation District" Law have brought about decided changes in district programs and activities. In addition to the needs outlined in the original program, the new program includes flood-prevention and multiple-use structures in watersheds, resource inventories, and broad land use planning.

Stevens County District, Minn.

The Stevens County District was organized in early 1956. Its area is 364,800 acres, of which 95 percent was in farms, mostly used for growing cultivated crops.

The original district program outlined the needs as soil and water management, erosion control, pasture improvement, woodland and wildlife improvement, and control of floods. It states the need for education to get farmers to recognize the value of conservation. Technical assistance and cost-sharing to aid cooperators in carrying out conservation plans on individual farms are stated to be district policy.

The supervisors revised their district program in 1963. They state, "We present this new program to serve as a new foundation upon which to build a better district and community." The primary purpose of the district was to continue to be "to provide leadership, education, and technical assistance to farm people in conserving soil and water through combinations of good land use practices."

In addition, their revised program includes such purposes as to (1) endeavor to make available financial aid where needed for the conservation and development of a resource; (2) initiate the small watershed program where this will help solve soil and water problems; (3) protect and expand outdoor recreation and wildlife resources; (4) provide cooperative action with all agencies and groups to realize full potential of natural resources to aid in the economic growth of the community; and (5) continue community planning.

This splendid program is backed with documentation of problem needs and solutions. Actions and district policies to accomplish the job are well stated.

Northumberland County District, Pa.

The Northumberland County Soil and Water Conservation District directors revised their program in 1963. They have released an impressive printed document that describes the natural resource problems and the needs for conservation.

The district was organized in 1943 covering only part of the county and expanded in 1949 to include all of it. From reading the program one can tell that the directors are proud of their district and want to make it a better and more attractive place for outsiders as well as for local residents. The district isn't large—only 290,560 acres. Eight hundred landowners are cooperators.

When the district was organized about 20 years ago, the principal assisting agency was the Soil Conservation Service. The revised program lists 25 local, State, and Federal agencies and private institutions and groups working as a team to get the conservation job done.

The distinctive feature of this district program is the comprehensive inventory of the agricultural, woodland, and urban uses of land, and projections of urban use to the year 2,000. Recreation and water uses are inventoried by watersheds, and potential sites for improvement and development are indicated on maps.

Part of this district is in the depressed anthracite coal area. Population in 1940 was 127,000 and in 1960 was 104,000. The directors believe that resource development, especially of water resources, will attract industry, increase tourism, and halt the declining trend in population.

Johnson County District, Nebr.

The Johnson County Soil Conservation District in southeastern Nebraska was organized in December 1942 with an area of 232,500 acres. Its program in 1943 listed six State and Federal agencies as giving assistance.

In order to meet production demands of World War II, corn and soybean acreages were increased with resulting acceleration of erosion. The supervisors believed that a large acreage then in cultivation could contribute more to the war effort if it were used for alfalfa and bromegrass pasture and hay. This would enable operators to handle their land more efficiently with the decreased supply of farm labor.

District objectives included retirement of steep eroded cropland to grass and trees, improvement of crop rotations, maintenance of crop residues, gully control, establishment of complete water-disposal systems, pasture management, and establishing windbreaks and wildlife areas.

The revised program developed in 1963 mentions 16 agencies and groups as providing help to the "soil and water conservation district." After 20 years 1,200 of a total of 1,500 land owners and operators were cooperating. About one-half of these had basic plans,

(Continued on p. 278)

Rice Irrigation Reservoirs Help Meet New Water Needs and Aid Economy

By William B. Davey

COOPERATORS of the Arkansas County Soil Conservation District in Arkansas now have water in greater quantity, with better quality, and at less cost than they ever had before.

The challenge of an increasing need for water and a steadily lowering water table is being successfully met by a new type of irrigation system that impounds surface water in reservoirs and circulates it for reuse until absorbed or evaporated. The Soil Conservation Service devised the system to meet the peculiar conditions of this rice-farming area.

Arkansas County farmers use a great deal of water for their rice and soybean crops. It takes about 1 acre-foot of water to grow an acre of soybeans and 3 acre-feet to grow an acre of rice. With more than 70,000 acres of rice and nearly 250,000 acres of soybeans planted annually, it doesn't take a slide rule to show that farmers need nearly half a million acre-feet or 150 billion gallons of water annually for those two crops alone.

This big demand developed in the early 1950's when a growing market for soybeans resulted in a big increase in acreage and heavy use of fertilizers to increase yields. Before then, soybeans had been grown mainly to keep down weeds in ricefields; the yield was of secondary importance. The soybean, like rice, is a "thirsty" crop, and the heavy fertilization called for still more water.

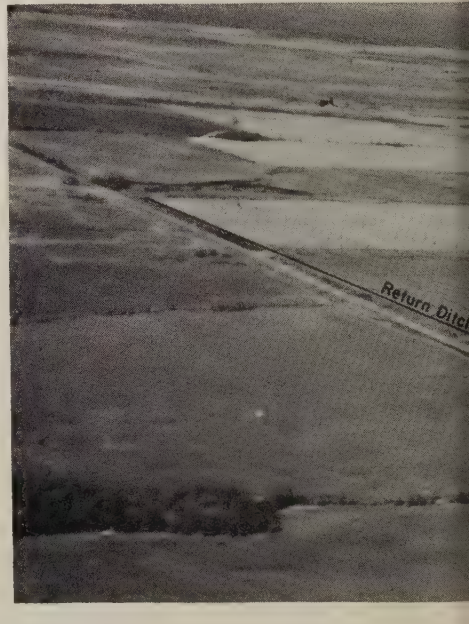
Before 1950 most of the water for irrigation in Arkansas County was pumped from deep wells. In 1925 the U. S. Geological Survey found the water table dropping about 6 inches a year and recommended that rice growers substitute surface water for ground water. The advice was disregarded. Then two things happened.

First the wells started pumping alkali water with a high pH. This caused lower yields, since rice does best in acid soil. With rice bringing $2 a bushel, this put the squeeze on farmers where it hurt the most—their pocketbooks.

Next, farmers began using more water when they started growing soybeans commercially. The answer to the problem of adequate water came when the technical know-how of the SCS was put to work with financial help of the Agricultural Conservation Program to construct new irrigation systems including reservoirs to hold water for use and reuse.

Some of the water for the reservoirs comes from surface runoff, but opportunity for trapping water by gravity is limited in the flat delta area of Arkansas. Most of the water is pumped from nearby bayous. It first goes into a storage reservoir, then into a canal from which it is released onto the cropland.

The water that isn't used by the crops or that doesn't evaporate is



The author is State conservationist, Soil Conservation Service, Little Rock, Ark.

recovered from the lower end of the field and returned to the reservoir for reuse. In this way, the farmer gets maximum benefit from the available water supply. Farmers say that "they run the water over their fields until they wear the wet out of it."

District cooperators have built some 330 reservoirs in the past 10 years. To do this, they moved an estimated 10 million cubic yards of earth. The water being stored in these reservoirs for crop production runs into the billions of gallons. The ACP share of the construction costs has amounted to about $420,000, and the landowners have spent about $4 million. Construction cost ranges from $189 an acre for reservoirs less than 25 acres in size to $93 an acre for those larger than 100 acres.

Construction of these reservoirs has not only provided Arkansas County farmers with plenty of good water for rice and soybeans, it has also brought many side benefits.

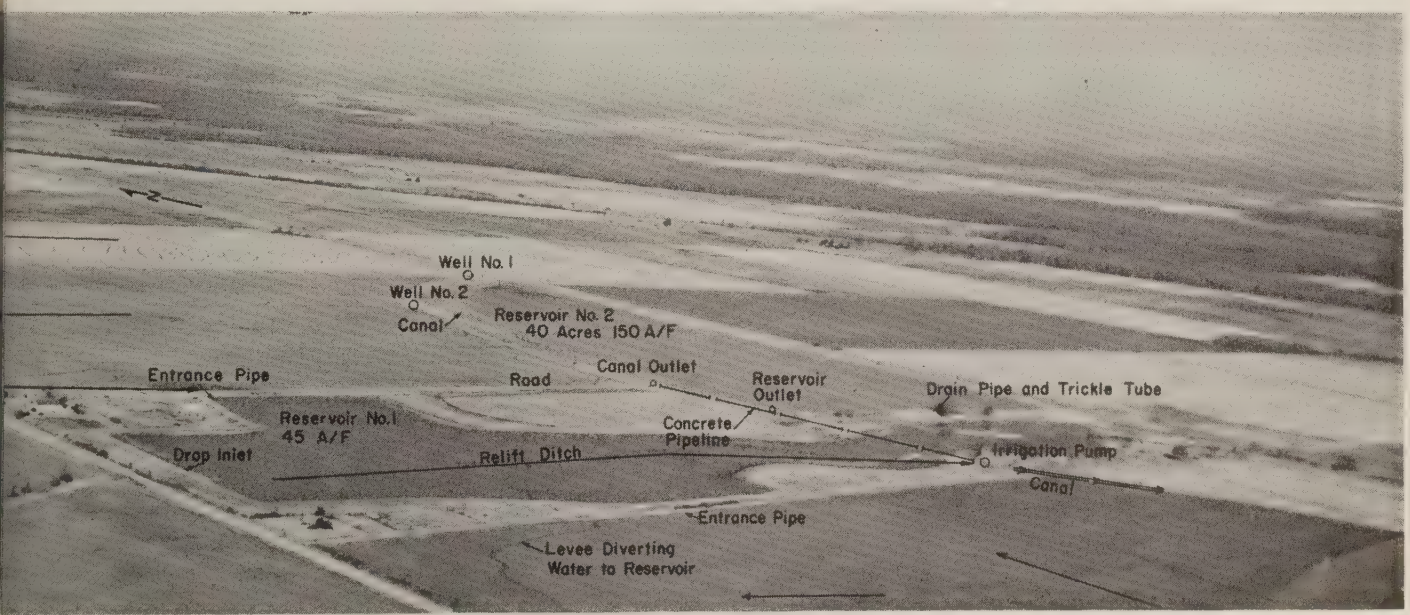
Farmland in the county that previously would not have sold for $50 an acre now brings as much as $400 an acre. An estimated $3,200,000 is spent annually to install field ditches and underground irrigation pipes and for the purchase of pumps and other equipment. The sale, operation, and upkeep of irrigation equipment runs into many thousands of dollars annually. And soybean production has attracted a $2½ million soybean processing plant to the town of Stuttgart, which employs 50 people. In addition to attracting ducks, nearly all the bayou-filled reservoirs contain bass, bluegill, and crappie.

All of this has meant increased business and better times in Arkansas County. And it has shown the value of ingenuity and teamwork in solving a water problem.

With proper irrigation, soybeans yield about 40 bushels per acre; without water, about 20.

Rice harvest brings the payoff for reservoir construction.

Reservoir No. 1 in foreground is filled by gravity flow. From there, water is pumped through underground pipeline to Reservoir No. 2, from which it is released for irrigation.



Revised Programs

(Continued from p. 275)

and substantial progress had been made in getting conservation on the land.

Important new additions to the district program are small watershed projects and rural areas development. Considerable emphasis is placed on wildlife and recreation lands. These include numerous ponds and impoundments from the larger watershed structures. Camping and cabin sites are considered as an important potential land use. Promotion of the area for quail hunting is mentioned as an additional source of local revenue. Adjustment in farm size to encourage livestock farming is still an important need.

Thurston County District, Wash.

The Thurston County District in western Washington has an area of 460,000 acres. At the time of organization in 1948 there were 2,848 farms, averaging 54 acres each. More than half the farm operators received off-farm income. While the average rainfall is 40 to 80 inches annually, lack of summer moisture seriously limits crop and pasture yields.

The original district program mentioned 24 land use problems and the corrective action to be taken. Included were such things as crop rotation, drainage, proper grazing, proper use of irrigation water, economic size of unit and type of enterprise, control of streambank erosion and flooding, tree planting and forest management, fish ponds, and restocking of lakes. Other problems related to soil fertility, weed control, and rodent and predatory animal control.

The program developed in 1962 stated that much had been accomplished but the three primary land use and management problems remained: Proper utilization of the droughty infertile prairie soils, proper utilization of wet, idle cutover land, and woodland management. The number of farm irrigation systems had increased steadily, and forage crops were grown on 90 percent of the cropland. A rapid change in land ownership was taking place, resulting in a 40-percent turnover in district cooperators. Only 526 farms had sales of $2,500 or more per year.

Important in the new program are attention to recreation and urban and built-up areas. In the district are 108 lakes totaling 5,500 surface acres, numerous State parks, and many private campgrounds. The district intends to make cooperators aware of possibilities for income-producing recreation on their land and to cooperate with all agencies in controlling pollution and maintaining recreational developments. The supervisors were cooperating with the county planning committee and the Rural Areas Development Committee in developing county resource plans.

Taos District, N. Mex.

Agriculture in Taos County is many centuries old. The Indians used irrigation for hundreds of years to raise corn, squash, and beans. Spanish stockmen settled in the county in the early 1600's. The range was open, and as a result of uncontrolled grazing one of the most serious problems today is the badly denuded rangeland. The Spanish system of inheritance, in which all children share equally, has divided and redivided farms so that 40 percent of the holdings today are less than 10 acres in size.

The Taos Soil and Water Conservation District was organized in 1941. Forty percent of its area of 1,443,000 acres is privately owned. Except for 62,000 acres of Indian holdings, the remainder is national forest, public domain, or State land. Since almost all of the cropland is irrigated, the original program gave high priority to the needs of this land. Range seeding and management, stock-watering facilities, and related improvements also received much attention. Erosion control, soil improvement, fish ponds and lakes, and development of outdoor recreation facilities were emphasized.

In a well-documented program printed in March 1964 entitled "Assuring Our Future Through Conservation," the board of supervisors charted the needs for action in the future. This district is in the Northern Rio Grande Resource Conservation and Development Project to accelerate conservation and development of resources for the economic betterment of the area. Substantial amounts of additional irrigation water are expected to be available through a diversion project. The recently completed Conservation Needs Inventory provides quantitative information about current problems.

The supervisors state, "Originally our primary interest was erosion control and soil conservation. We are now concerned with the full range of development, use, and conservation of soil and water resources, recreation, urbanization, and other resources." Specifically the objectives are to (1) increase small watershed activities for flood prevention, watershed protection, and multiple use; (2) complement the district program with rural areas development; (3) gear the program to meet needs for outdoor recreation including farm resources; (4) encourage economically sound family-type farms; and (5) promote research to aid in the orderly resource development and conservation.

Soil Sterilants

Before you use soil sterilants for weed control, know where the roots of nearby desirable plants, including trees and shrubs grow, and know where runoff water could take the sterliant; once in the soil, the chemicals can kill plant growth for several years.

A Question for Landowners—

Is Your Dam a Bargain?

By H. L. Cappleman

WHETHER shopping for furniture or building a dam, we all like to think we're getting a bargain.

But in seeking bargains we must be careful to compare quality as well as cost if we are to avoid becoming like Oscar Wilde's cynic, who "knows the price of everything, and the value of nothing!"

For most of us, bargains in earth dams are harder to recognize than bargains in groceries or hard goods. And the consequences of risking our money on a doubtful bargain in dams may be far more serious than with groceries.

Picture the plight of the owner of the "bargain" car with faulty brakes numbly staring at the junk that was his car lying in a mass of rubble that was lately the smart facade of an expensive building. Over the drumming thought that "It's all my fault," the despair of the luckless car owner may be momentarily lightened by the thankful prayer that no one was seriously injured.

Equally chilling is the lot of the owner of the "bargain" dam, standing by the ragged scar that was once the embankment, gazing over the eroded subsoil that was once his best field, past the tumbled mass of debris that was once the county bridge, at the silty mess covering what was once his neighbor's strawberry crop. Like the car owner, his gloom too may be pierced with relief at the lack of casualties. But here the similarity of their fortunes ceases.

On regaining his reasonable senses, the car owner may look forward to the recovery of his investment in the car and the payment of the damages through the medium of his collision and liability insurance. True, he stands to pay his price in inconvenience, harassment, embarrassment, and regret, but his financial liabilities may be matters of mere technical concern.

Not so, the dam owner! Even assuming that he could and did afford liability insurance that covers such events, what portion of the damage does it cover? Will it return to him his original investment in the dam? Or pay the cost of replacing the dam? Will it mollify the motorists who must detour pending replacement of the bridge? Will it convince his neighbor that he was justly compensated for the crop he couldn't harvest? Will it replace his own ruined field? Or recondition his neighbor's? The gloom deepens.

Such things happen sometimes. And when they do it is often because of the innocent belief of uninformed people that a dam is just a pile of dirt and "any old dirt will do." This philosophy often spawns the "bargain" dam—conceived without benefit of design and built without benefit of supervision on a site unspoiled by investigation. At worst, "bargains" like that can lead to tragedy; at best, to excessive maintenance cost and worry.

Horror stories notwithstanding, dams serve many beneficial purposes. Under certain conditions they are vital to the economy and contribute to the health and well being of individuals and communities. In the proper circumstances they can be built and used with every reasonable assurance of safety and proper functioning throughout their economic lives.

Such reasonable assurance is based on adequate planning, sound design, and competent construction; it requires the services of professional engineers and geologists to perform surveys and investigations, develop plans and specifications, and inspect construction. The cost of such services varies with the scope of services required to do the job. What constitutes a reasonable cost of engineering services varies with the complexity of site conditions and the hazards (failure consequences) involved.

Whenever water is impounded in considerable quantity and at considerable depth or height above the flood plain a hazard is created. The extent and nature of the hazard will depend on the location of the damsite in relation to things or people that might be damaged or injured as a result of failure of the dam.

The hazard of any given site may vary from simply the risk of loss of the owner's investment to the risk of catastrophic loss of life and damage to property. The higher the hazard, the higher the owner's risk and the greater the need for extensive investigation, conservative design, and good construction inspection.

Dam building is usually motivated by economic considerations; the benefits to be derived from the dam are expected to exceed the cost of building it. However, the builder also has a moral responsibility to consider the possible effects of the dam on the community and to do his best to minimize the danger to the community.

The designing of earth dams is by no means an exact science. It consists of about two parts science

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and one part art, seasoned with intuition and molded by judgment. It requires the application of the principles of hydrology, geology, hydraulics, mechanics, economics, and common sense by experienced geologists and engineers. Even when accomplished by trained and experienced people, it is no sure guarantee that failure will not occur under some combination of circumstances. Therefore, the decision to build a dam must be based not only on the relationship of benefits to costs but also on the relationship of benefits to risk incurred by the creation of the hazard.

For dams above a certain size, many States have legalized the owner's responsibilities to the community. The requirements for obtaining State permits and licenses for dams vary considerably. Usually they provide for reviews of designs and inspection during construction of all dams more than a certain height or impounding more than a certain volume of water, or both.

These reviews and inspections (for which the owner pays certain fees) do not relieve the owner of the responsibility for the design of the dam or the inspection of construction, nor do they relieve him of any liability for the consequences of failure. Their purpose is to insure that reasonable precautions have been taken to insure the safety of the community.

Whatever the law may provide, the requirements for State permits are usually based on arbitrarily chosen sizes of dams and reservoirs. Size is not a good criterion of hazard. Many cases of serious damage caused by failures of small dams are on record. I know of one instance in which the failure of a dam only 10 feet high and impounding only 5 acre-feet of water caused damages in six figures.

The location of the dam is the key to hazard. And hazard is the key to the owner's risk, regardless of the size of the dam. Reliance on State permit requirements to indicate the need for engineering services is a misinterpretation of the intent of the regulations and amounts to foolhardiness on the part of the owner.

Soil Conservation Service policies and standards are intended to insure that Federal funds are not applied to the creation of community hazards or ineffective practices.

The retaining of good engineering services does not assure the owner of a dam in the site he desires. Sometimes the best service the geologist and engineer can do for the owner is to recommend that a dam *not* be built.

Generally, the economic feasibility of an earth dam depends on the use of materials obtained from borrow areas at or near the damsite. The suitability of soils for use in earth dam construction varies with the characteristics of the soils, the topography of the site, and the character and condition of the foundation.

Proper design and construction methods will allow the use of most soil materials for this purpose, but, for any given site, the cost of the dam will likely increase as the quality of materials decreases. The examination of a site should include an assessment of the soil erosion potential and an estimate of sediment production from the watershed. Effective land treatment commonly needs to be planned to accompany (or, better, precede) dam construction. In some cases the combination of conditions found at a site or the prospect of sedimentation from the watershed above may render the undertaking so hazardous or so unlikely to function as to make the owner's investment a very poor risk.

The cost of such so-called "negative reports" is not wasted if they save the owner a large investment in a worthless site. The wise owner will heed such recommendations and either verify them by further studies or abandon the project.

When you decide that the benefits to be derived from a dam outweigh the cost and hazard of owning one, then it is good business to protect your investment and reduce your risk by the use of the best methods and talent available. These methods and talents may not be cheap, but, when measured against the consequences of failure, they are true bargains in the long run.

Have You Seen?...

• "Know Your Soil," by Soil Conservation Service, USDA's Agriculture Information Bulletin 267. Soil information is useful to all people—farmers, ranchers, and foresters, and city people ranging from homeowners to land appraisers, realtors and builders, to city planners, manufacturers, and insurance companies. This bulletin tells why a soil survey is necessary, how it is made, and why a soil survey report (published after the soil survey is finished) should be consulted.

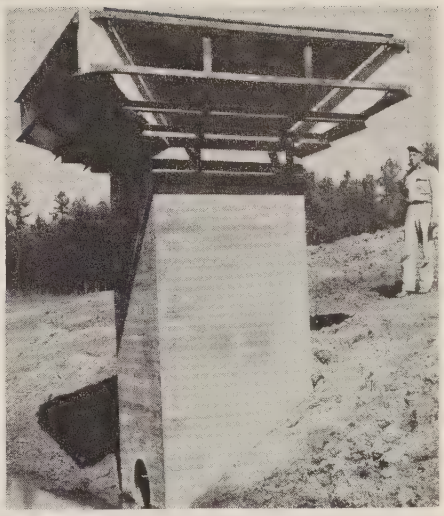
• "Russian-olive for Wildlife and other Conservation Uses," by A. E. Borell, Soil Conservation Service, USDA Leaflet 517, superseding Leaflet 292. No other tree surpasses Russian-olive for wildlife food and cover in the Western and Plains States. This leaflet tells what Russian-olive is, where and how it grows, and where and how to plant it; describes its care and management; and lists birds and mammals known to eat Russian-olive fruit.

◆

It's the green blades of grass that manufacture food for the plant. If you mow off 90 percent of the blade, root growth stops for several days to as much as more than a week.

Watershed Research Seeks Ways to Improve Planning

By L. L. Kelly



The improved design for a spillway becomes a reality when the dam is built in the field.

WATERSHED research has been carried out by the U. S. Department of Agriculture in cooperation with State Experiment Stations since the early 1930's. In the Department, the responsibility for research in this field for farmlands now rests with the Agricultural Research Service and for forested lands with the Forest Service. The Economic Research Service and the economics departments of the State Agricultural Experiment Stations provide basic economic data to express the physical facts in terms of dollars and cents.

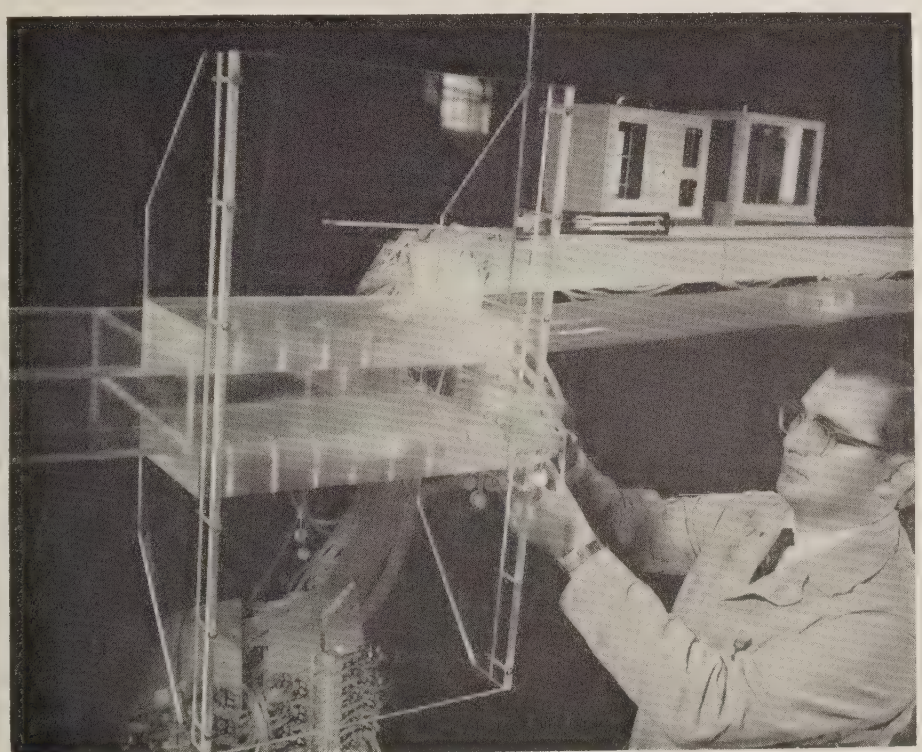
Additional research information from these experiment stations and universities and much information from the U. S. Weather Bureau, U. S. Geological Survey, and other agencies are adaptable to the needs of planning and designing programs for watershed protection. The Soil Conservation Service uses many of the research findings in the watershed protection program.

To plan and design an efficient and effective program for watershed protection and development requires estimates of many features of streamflow and sedimentation. Among them are: (1) How large the floods are now and how often they come, and what effect the planned program will have on the size and occurrence of floods in the future; (2) how much sediment is carried out of the watershed now and how much will be carried in the future with the program in operation; (3) how changes in streamflow and sediment loads will affect stability of stream channel systems; and (4) what the dependable water yield of the watershed is now and what it will be in the future with the program installed.

If these and similar estimates can be made with a high degree of accuracy, costs of the program can be kept to a minimum; if not the planner must increase the "factor of safety" at greater cost of construction. One of the aims of research is to provide the tools for making these estimates as accurate as possible.

But making estimates of the flood flows likely to occur on a particular watershed is a complicated task. It is obviously too expensive to measure the flood flows from the thousands of watersheds that are in need of protection programs. The flows must be estimated from a knowledge of the relations between rainfall, soil, vegetation, and the many other factors influencing flood runoff.

We all know that floods are caused by rain; but sometimes big rains cause big floods and sometimes they don't, and sometimes



A transparent laboratory model of a spillway is used for study in the St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minn.

The author is chief hydrologist, Soil and Water Conservation Research Division, Agricultural Research Service, Beltsville, Md.

No. 76

This is the seventy-sixth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

little rains cause big floods. There is a relationship between rainfall and runoff, but it is a complex one, affected by the amount and intensity of the rain, the amount of moisture already in the soil, the type of soil and geology, the vegetation—as many as 30 different factors altogether.

The Agricultural Research Service and the Forest Service are providing information on this relationship. Studies are being carried out on between 400 and 500 research watersheds to sample the combinations of soil, vegetation, and farming practices on the land where floods start. Additional research watersheds are needed in major soil areas where this kind of information is not being obtained.

Equally important are the estimates of sediment likely to be produced by a watershed. Here, the planner starts with the conservation axiom that "sediment in streams is the product of erosion on the land," and he must express this relationship with numbers. This is not a simple relationship, for many factors of climate and soil influence erosion. Also, all the eroded material from a hill slope is not necessarily carried downstream to the first reservoir; some is deposited at the foot of the slope, some on the flood plain. The streambanks, too, contribute sediment.

The planner relies on aids like erosion prediction equations, information on gullying and streambank erosion processes, systems for computing sediment transport and delivery, and knowledge of the trap-efficiency of reservoirs to estimate the sediment likely to be deposited in a reservoir.

Engineering structures are another important feature of the watershed protection program. Research is carried out continually to improve the efficiency of the various parts of such structures so the program can be installed with least cost. Much of this research is done in laboratories with small scale models of the real thing. For example, air is used instead of water in many cases to determine efficiency of the spillway entrance. The hundreds of laboratory tests required to arrive at this efficiency under various conditions can be run much faster with air than with water and the results made available much sooner.

The closed-conduit spillway with drop inlet, another example, has been used for many years, but continual improvements are being made. Various trash racks also have been tested in the laboratory in determining the best one.

Although the purpose of research is to predict what will happen under a given set of conditions, sometimes, because the hydrology and sedimentation processes in watersheds are so complex, the researcher can take only "samples" of the thing he is studying and, from an analysis of the samples, state some rules and provide average figures for use as the tools for making estimates. But what he seeks most is the natural laws that govern the processes themselves to provide the best tools for making accurate estimates and for the most economical and efficient planning and installing of watershed programs.

Moon Stones

Residents of six counties of western Iowa have been asked to look for stones while plowing and report unusual finds to their local soil conservation or county agent offices.

In this way, the National Aeronautics and Space Administration hopes to find fragments from the moon or outer space for study.

The western Iowa area was chosen because the thick blanket of windblown material that underlies the loess soil is remarkably free of native stones.

Doubled Benefits By Shift to Grass

A double benefit to his farming operation was planned when R. J. Dinwoodie, of the Fort Berthold Soil Conservation District, N. Dak., replaced his cropland with grass.

Cropland was converted to grass to better stabilize the economy of the 2,000-acre unit under the Great Plains Conservation Program. This permitted him to add to his cow herd and decreased the cost of operation of small pieces of land away from farm headquarters.

Dinwoodie seeded 120 acres of cropland to native grass for grazing and 44 acres of cropland to tame grass for hay. He also added stock-water dugouts, wind stripcropping, and grassed waterways.

Wildlife Food

A three-way cooperative agreement for testing wildlife food plants has been developed between the California Department of Fish and Game, California Division of Soil Conservation, and the Soil Conservation Service.

A similar agreement covering cooperative work on waterfowl food plants has been in existence for some time. This has worked out so satisfactorily that the two State agencies requested it be expanded to cover food and cover plants for upland game.

Testing will be done by direction of the Pleasanton Plant Materials Center.

Conservation Saves Farmers' Water In Southern Utah Drought Counties

By Clyde W. Larsen

CONCRETE ditch lining is one of the conservation measures farmers in drought-striken southern Utah counties have used with profit to bring short supplies of irrigation water to their hay and other crops instead of letting it get away through earth canals and ditches.

They recognized 15 years ago the advantages of installing irrigation water-management practices on their farms and are speeding up the installation of this and other water-saving practices like land leveling.

Irrigation companies in the Delta Soil Conservation District, for example, commenced to line their main canals with concrete in 1960. In the past 3 years they have installed 10 miles of concrete canal lining and ¼ mile of plastic liner. This year, 1½ miles of plastic liner will be installed in a flat canal that has a higher water loss. Most of the canals and irrigation ditches also have been lined with concrete in the St. George area, where a visitor would have to search to find water running in old earthen ditches.

In the Delta district, farmers have leveled 38,000 acres to the proper grade. This is about 75 percent of the irrigated land in the district. Many old timers like Roland Crane of Salina, Max Tuft of Monroe, and V. C. Carling of Fillmore have leveled most of their irrigated land to a grade designed by the Soil Conservation Service.

In recent drought years, water users have made these and other water-management practices pay off. By carefully measuring out water to their crops, farmers in southern Utah produced some of the largest first-crop cuttings of hay on record in 1961 and 1963, in spite of one of the worst droughts on record. They were followed by near-normal second-crop cuttings and average grain yields on those farms that had enough water for one application on the second cutting of alfalfa hay and one to two irrigations for the small grain. Edson Alvey, a school teacher and farmer, in the Escalante Soil Conservation District, for example, has been averaging 7 tons of alfalfa hay with three cuttings, since he has leveled his fields and began managing his irrigation water applications and maintaining proper soil fertility.

This concrete irrigation ditch lining in the Delta Canal System is serving its third season of water saving.

"Concrete ditch lining has answered my irrigation water-control problem," says Vernon Johnson of Aurora in the San Rafael Soil Conservation District. "By remodeling my irrigation system and lining my ditches with concrete, I now can control the irrigation water and regulate it without waste almost as fast as I can walk down the ditch. The water gets there now as fast as I can regulate it."

The Loss Creek Irrigation Company near Circleville in the Piute County Soil Conservation District completed 3¼ miles of concrete canal lining in the spring of 1961. Rex Whittaker, a lifelong resident, whose Lizard Ranch is at the lower end of the canal, reports on his water-saving experiences:

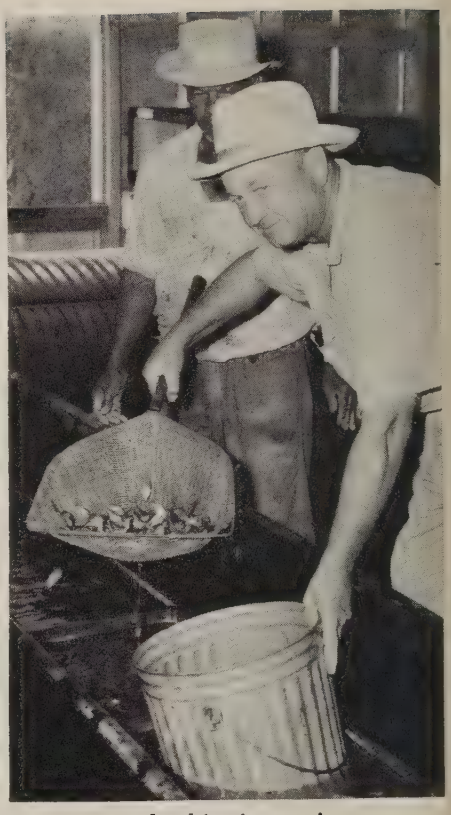
"The drought of 1959, 1960, 1961, and 1963 has been especially hard on irrigation farmers who are depending on the natural streamflow for a water supply. In 1960, the old earth canal lost all our water, and I couldn't irrigate a thing. In 1961, with the same amount of water diverted into the head of our new concrete canal, I have been able to irrigate about 50 acres of potatoes. The drought of 1963 lowered the creek near or to an all-time low, until I was receiving only 20 percent of my primary water. But, thanks to the concrete canal, I was still able to mature 40 acres of oats."

The author is area conservationist, Soil Conservation Service, Richfield, Utah.

Farmers, cooperating with their soil conservation districts, are learning more about the amount of water and time to irrigate that different crops require. Take Gale Whittaker in Piute County:

He will tell you that "conservation practices that save water make better crops and neighbors." He constantly checks the soil moisture in his potato fields and applies only the amount of water needed to replace the moisture used and keep the vines thriving.

The sprinkler method has been selected by many farmers in Wayne County among the several methods that can be used to obtain good, sound water management. Twenty-five sprinkler systems, covering 3,000 acres, were installed in 1961-62 and 1963. To encourage them to irrigate according to the moisture in the soil, the Fremont River Soil Conservation District makes moisture probes available to cooperators at cost. SCS technicians demonstrate their use.



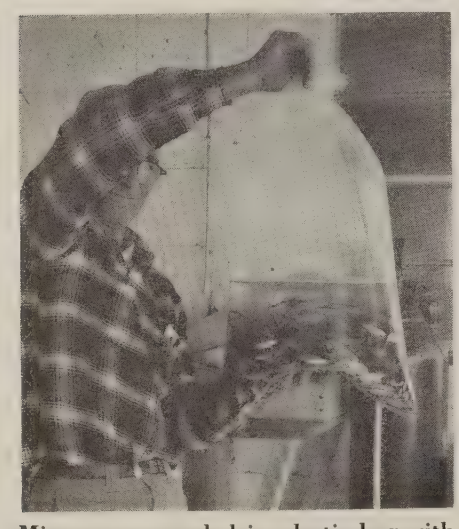
Grading and shipping minnows are part of Frank McCortney's regular conservation farming operation.

Minnow Farming Expands As Land Use in Arkansas

By Roy A. Grizzell, Jr.

IF you should go bass fishing with minnows in Florida, Texas, or in many other States, 9 chances out of 10 your minnows were raised in Arkansas.

Early in 1962 we conducted a survey of minnow farms in the Land-Of-Opportunity State. This survey showed 141 landowners engaged in minnow farming, utilizing about 8,000 acres of land. Of this number, 72 farmers were operating enterprises of less than 15 acres and were considered part-time operators.



Minnows are sealed in plastic bag with water and air for shipping.

In 1964 the up-dated survey showed the number of operators had increased from 141 to 157 and the amount of land from 8,000 to 9,200 acres.

The demand for minnows will continue to increase. In fact, the U. S. Census Bureau figures indicate that each morning there are 7,000 more people to be fed, clothed, and housed. About 1 in 4 of the men and 1 in 10 of the women will become fishermen and fisherwomen. Operators who produce their fish most efficiently will continue to expand, following the trend in other types of agriculture.

The Anderson Brothers, cooperators with the Lonoke County Soil and Water Conservation District, claim to be the largest minnow farmers in the world. They devote more than 800 acres of their farm to minnow production and also act as wholesale agents for numerous other farmers, such as H. H. Harvill and Son, cooperators with the Arkansas County Soil and Water Conservation District.

To farmers engaged in minnow enterprises, the Soil Conservation Service for many years has been giving technical assistance through the districts on pond design and construction, stocking of brood minnows, management of ponds to produce optimum growing conditions for young minnows, harvesting operations, and control of trash fish, diseases and parasites, predaceous water insects, crayfish, and aquatic weeds. In fact, the opportunities have proved sufficiently lucrative to lure two former Soil Conservation Service biologists into the business.

Most minnow farmers in Arkansas produce the golden shiner minnow. Some specialize in goldfish and fatheads. A few grow Israeli carp or the common carp for trotline bait.

Minnow farming, like other types of modern agriculture, requires a scientific approach. Oper-

The author is biologist, Soil Conservation Service, Little Rock, Ark.

ator Malcolm Johnson of the Delta Farm Fisheries and a cooperator with the Drew County Soil and Water Conservation District explained to a group of foreign nationals recently that he had to run his business with the same care as a hospital. He uses antiseptics in all steps of his operation to prevent disease and parasite epidemics. Each morning at daylight during the warm months every pond must be checked for oxygen shortage in the water.

Many of the larger minnow farmers have developed rotation systems alternating cultivated crops with fish. Crops commonly grown following fish are rice and soybeans.

After several years of continuous rice, yields on even the best Delta land begin to decline. One of the principal factors in reduced yields is increased weed competition. Many noxious weeds and weed seed are rotted when rice is followed by minnows or other fish. Organic materials are decomposed and return as basic plant-food material to the soil. Yields have been remarkable when the land is planted to field crops again. Rice commonly yields 100 or more bushels an acre and soybeans 30 bushels an acre or better after fish.

Minnows on well-managed farms maintain profit margins equal to or often superior to other farm products. New techniques are constantly being developed and applied. This is one nonsurplus farm product that is experiencing an increasing demand.

Tank on pickup bed for moving goldfish from ricefield to holding ponds.

Large Watershed Dam to Provide Recreation Area

By John M. Cross

ONE of the largest reservoirs under the Watershed Protection and Flood Prevention Act (Public Law 566, as amended)—the Cotile Reservoir, a major feature of the Bayou Rapides watershed near Alexandria — is being built in Louisiana.

It also is one of the first reservoirs to be approved for Federal cost-sharing for recreational benefits when a supplemental work plan agreement was pushed through soon after the change in the law which allowed cost-sharing for recreation.

The specifications for the Bayou Rapides project call for a dam containing 885,000 cubic yards of earth; a lake covering 1,775 surface acres, a thousand or more of which will be maintained for recreation; and 18,573 acre-feet of water available for irrigating some 10,000 acres of good Red River valley land below the dam. Bayou Rapides will be converted into a delivery system, taking the water to users, and will provide 20 miles of fresh water fishing.

Sponsors of the project are the Rapides Parish Police Jury (governing body) and the Lower West Red River Soil Conservation District. The Soil Conservation Service provided engineering and design assistance.

The cost of the project is estimated at $4,664,600 including expenditures for land treatment and an irrigation distribution system that will cost $233,000. An $1,500,000 estimate on the construction of the dam will be divided equally between local and Federal funds. Economists say the project will pay $2.60 in benefits for every dollar spent. Dollar value of the recreational benefits alone is estimated at $111,735 each year.

The 1960 census shows 263,992 people living within a 50-mile radius of the proposed site—possible users of the recreation facilities. Based on studies made in similar sites the sponsors predict that 48,750 visits a year will be made to the reservoir.

On their 2 tracts of land totaling 100 acres adjacent to the recreational pool, the Police Jury have agreed to build a minimum of 60 picnic units and 30 camping units. They plan to provide 800 feet of beach area and will build dressing rooms, showers, and sanitary facilities next to the area. Boat ramps and docks will be built, too. Two shelters will be provided, and 4 miles of access roads will be built.

Local people have a keen interest in the Bayou Rapides project. They voted a $2¼ million tax on themselves to raise their share of the funds to help pay for this project and other watershed developments. The Police Jury purchased all the land needed for the project. There are many secondary benefits that can't be expressed in dollars and cents. Better land use, tourist trade, efficiency in farming operations, vitalization of local business, and development of rural areas are some of those benefits.

The author is assistant State soil conservationist, Soil Conservation Service, Alexandria, La.

'Step Dam' Builds Self and Stops Gully with Sediment

By Bill Phillips

A UNIQUE "step dam" has met expectations of its creators since construction started 10 years ago in Riverside County, California.

Conceived by Vern W. Hale of the Soil Conservation Service and Rancher Louis Haskell, the first of five steps was poured in 1953 in an erosion gully gashing cancerously across a fertile portion of the Haskell Ranch. The gully was the result of runoff water from a 3,000-acre watershed seeking quicker access to San Timoteo Creek.

Haskell and his brother, Kelsey, own 3,200 acres of what was once the pioneer Singleton Ranch in San Timoteo Canyon. They started worrying about the continual widening of the erosion channel; and Louis Haskell conferred with Hale, who agreed that erection of a concrete dam would pose a tremendous problem. Estimations showed expense of such a dam would run $15,000 to do any good in the gully, which was 30 feet deep and 70 feet wide.

"And," Hale recalls, "there was no guarantee a storm would not wash out a single wall dam."

So Haskell and Hale came up with an idea: Why not a series of check dams, one behind the other, constructed over a period of years, with natural sediment allowed to fill behind each 3-foot wall? As Hale noted: "The dam is supposed to stop erosion, which is what it's doing; but it takes erosion upstream to help build the dam."

The first wall, of concrete, was poured with the sides sunk 2 to 3 feet back into the banks of the gully, and rising 3 feet higher than a level 12 feet in the middle, to train the future flow of floodwaters into the center of the channel. Floodwaters through the gully filled the upper side of the wall with debris. Then a second 3-foot wall of concrete was erected, 6 feet upstream from the first, and the fill between was covered with a concrete floor so flowing waters would not dig.

"It didn't get a good test until 2 or 3 years ago," Hale reported. "The top lift wasn't in. There was a cloudburst above Calimesa. Two inches of water fell in 10 minutes in an early fall flash flood. That's equal to a 50-year expectancy estimate. But all it did to the step dam was just clean out behind it and level out an area for a half mile that was 5 feet deep behind the top step."

Over the 10-year period, growth of the dam has been at a step every other year. One year, giving Nature a little help at the compaction, they got two in, and then went 4 years without anything.

Visit the location in the golden waving barley field where the steps are located, about 200 feet from the channel of San Timoteo Creek near the railroad tracks, and you can see that, over the 10-year period, depth of the eroded channel has been reduced approximately 17 feet. Hale figures that two more lifts will turn the channel behind the dam location into a gentle swale where grain will grow again. Then, by putting in small check dams up the gully every several hundred feet, soil conservation techniques in a long-term program will turn the length of the channel into swaled, grassed land, eliminating the gully.

Technical aspects of the step dam include a 2 to 1 slope, weepholes to keep down pressures on the steps, concrete used without steel, and footing 2 feet deep for

Step dam is built in stages as sediment fills in behind each new concrete wall.

The author is managing editor, *Beaumont Daily Gazette*, Beaumont, Calif.

the 1-foot thick steps.

"What we have here after 10 years," Hale explains, "is the equivalent of a 15-foot dam." However, it's a debris dam, not a storage dam; and, unlike a single-wall, reinforced concrete dam, its chance of failure is much less—yet it has been built at approximately 10 percent of the cost of your usual upright dam."

Haskell, president of the San Gorgonio Soil Conservation District, estimates the cost at $300 per 3 feet of height lift, or $1,500 for the five steps now constructed.

TREES AGAINST THE WIND

By David W. Despain

TREE windbreaks throughout Wyoming's Cody Soil and Water Conservation District are adding protection to land and property from damage caused by up to 75-mile-an-hour winds that sweep down the North Fork valley of the Shoshone River from Yellowstone Park to Cody.

One incentive to ranchers to plant windbreaks as part of their conservation programs planned with Soil Conservation Service help has been the successful tree planting made early in the 1930's by Jim Legg, who has been a resident of the valley since 1904, and was practicing conservation long before he helped organize the Cody district in 1947. During his more than 16 years as a district cooperator and supervisor, he has seen a lot of good conservation work applied on his own ranch and elsewhere in the valley, but he says no conservation measure has given him more satisfaction than the windbreak which now protects his home.

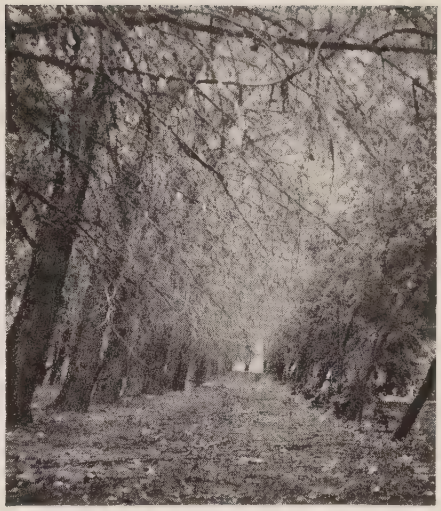
Legg shows off windbreak planted in 1932.

It was after Legg lost his barn roof for the second time, in 1932, that he decided to plant the windbreak. He obtained a supply of tree seedlings from the county Extension agent, read everything he could find on windbreaks, and used his own judgment in developing a planting plan.

He knew it would take a sizable windbreak to slow down the high valley winds. He also wanted the windbreak far enough from his buildings so winter snows would not cause trouble.

He set out 10 rows of trees covering approximately 3 acres, using cottonwood, blue spruce, green ash, boxelder, Northwest poplar, laurel leaf, willow, and Caragana. The rows were spaced 15 feet apart, with the adjacent second and third rows of spruce 20 feet apart; and all the trees were spaced 10 feet apart in the rows except the spruce at 20 feet. The first windbreak row was planted 100 feet from the buildings, to allow ample room for more than 5 feet of snow accumulation for about 25 feet on the leeward side of the windbreak. For the first 5 years a 4-foot-wide strip close to the trees was kept clean by cultivation, to eliminate competition for moisture by weeds; livestock was kept away from the trees, and bud worms on the spruce trees and aphids on the cottonwoods had to be controlled.

The author is soil conservationist, Soil Conservation Service, Cody, Wyo.



Windbreak trees bent over by 75 m.p.h. valley winds.

The spruce trees that now tower more than 50 feet high on the north side of his home show how Legg has thrived. More important, as he says:

"When you enter the windbreak area from the valley road it is like stepping indoors. In fact, from the house, you have to look far out into the valley to tell if the wind is blowing."

Grass Seed Cost

When you buy grass seed, look at the label. Multiply the percentage of pure seed by the percentage of germination (it's all on there) and divide by 100. Divide this into the cost per pound. This tells you what pure live seed, the kind that makes grass plants, costs. You'll likely find a mixture that costs more per pound is cheaper in terms of live grass stand.

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LAND FOR AMERICANS. By Marion Clawson. 141 pp. 1963. Rand McNally & Co., Chicago. $2.25.

"Trends, prospects, and problems" is the subtitle of this popular condensation of *Land for the Future,* the thoroughgoing study for Resources for the Future by Clawson, R. Burnell Held, and Charles H. Stoddard.

The sober facts of that report are presented here in brief and sprightly fashion intended to appeal to the general reader. Issuance as a paperback in the Policy Background Series makes it easily available to a wide audience.

The scope and plan of the smaller book are similar to those of its source. Its thesis and conclusions are the same.

Today, the average American has the products and services of 12½ acres of land. His father in 1920 had about 22 acres; his son in 2000 will have perhaps 7½.

So the author epitomizes the trend of land supply in this country. How this affects land use today and in the future is the subject of the book.

The several land uses are considered in an order calculated to emphasize new problems and values. First comes "land to live on", or urban land, and then land for recreation. After these, the classic concerns of cropland, forests, and pasture are evaluated.

Private citizens, public discussion groups, and educators all will find subject matter for serious thinking in this compact volume.

—B.O.

OUR NATURAL RESOURCES. Second Edition. By P. E. McNall. 280 pp. illus. 1964. The Interstate Printers and Publishers, Inc., Danville, Ill. $4.75.

This attractive cloth-bound book is a revision of a 1954 edition that has been widely used as a high school text and library reference on conservation. Style of presentation and 111 photographs, maps, and charts make it suitable for use at the junior high school level.

The 23 chapters provide a brief survey of natural resources, their current status, conservation problems and needs, and the Nation's future requirements. The introductory chapters deal with the meaning and purpose of conservation, what natural resources are, and their use by man for better living.

Five chapters concern the power and energy resources—coal, oil and gas, the atom, sun and tides, wind and water — with emphasis on water for industrial and private use. The revised 30-page chapter on minerals has a brief new section on plant life, minerals, and commercial fertilizers. Several other chapters have been expanded; statistical data in all have been updated.

Although the statistical content of the eight chapters dealing with soil information, land-use problems, erosion, and conservation measures was brought up to date, little was done to modernize terminology. Forest and wildlife resources and their management are discussed in connection with good land use.

Those who like to explore additional references on conservation and resource use will miss the bibliography that was a part of the first edition.

The author again hopefully concludes the book with a statement for our natural resources and welfare: "Some progress has been made in changing our thinking from ways of exploitation to ways of conservation, and when the young people of the nation become completely alert to this necessity, we can rest assured that these resources will not be wastefully used."

—Adrian C. Fox

3840

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